# MODERN PLASTICS

E. F. LOUGEE, EDITOR • DR. G. M. KLINE, TECHNICAL EDITOR • C. A. BRESKIN, PUBLISHER

MAY 1939

VOLUME 16 NUMBER 9


## • GENERAL INTEREST



## • TECHNICAL SECTION



## • NEWS AND FEATURES



Cover Color this month SOUTH SEA BLUE (Created by Textile Color Card Association)

### JUNE

The *Yankee Clipper*, first of four Boeing planes to inaugurate Trans-Atlantic passenger service for Pan American Airways next month, is built for safety and styled for comfort. Its control panel is pictured above. Likewise, the good ship *Panama*, which has just begun its regular treks between New York and the Canal Zone, draws heavily upon plastics for decorative and lighting treatments. Both will be pictured and detailed in June.


Published the 5th of each month by Breskin & Charlton Publishing Corporation, 122 E. 42nd St. (Chanin Bldg.), New York, N. Y. Phone Ashland 4-0655. Western office, 221 N. LaSalle St., Room 616, Chicago, Ill. Phone Randolph 6336. Publication office, Twentieth and Northampton Sts., Easton, Pa. Also publishers of Modern Packaging, Packaging Catalog.

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Subscription price $5.00 per year in United States, its possessions and Canada. All other countries, $6.00 per year. Price this issue, 50c per copy.



Printed in U. S. A. Acceptance under the Act of June 5, 1934, at Easton, Pa., authorized Nov. 24, 1936. Back numbers dated 3 months or more preceding current issue, when available, $1.00 per copy, excepting October issues which are $2.00.

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MODERN PLASTICS

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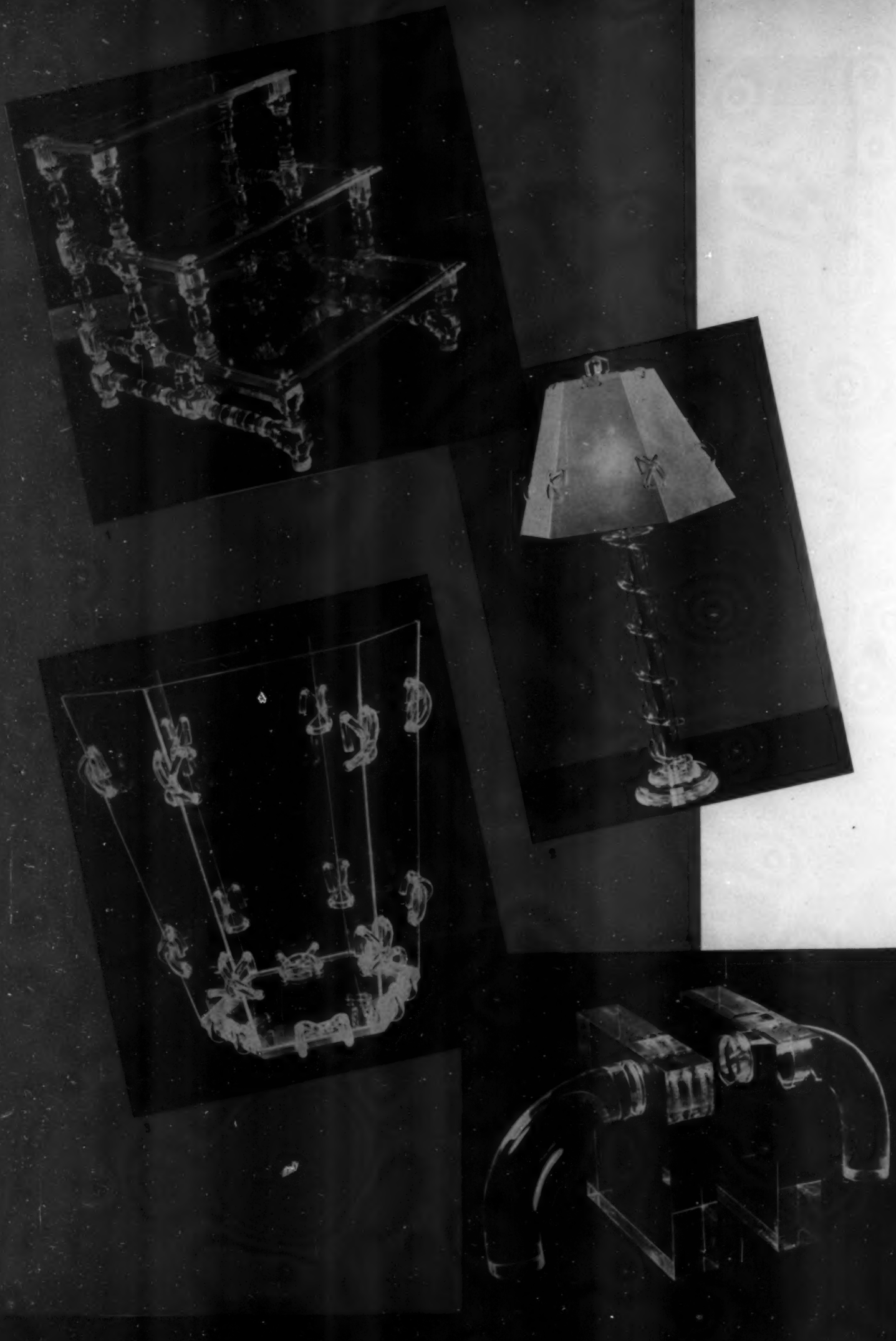
# TREASURE ISLAND

by ETHEL LEWIS, A.I.D.

**Treasure Island, created to serve as an airport in San Francisco Bay, is the home of the Golden Gate International Exposition**

TREASURE ISLAND, THAT LITTLE MAN-MADE island in its glamorous setting in the center of San Francisco Bay, is all that its name implies. Even after you've seen it and walked its length and breadth you will probably think you only dreamed it or read about it in a highly romantic and imaginative tale of adventure. Officially the little island is just the home of the *Golden Gate International Exposition* but for anyone who has visited it the whole exposition immediately becomes Treasure Island. When you see it from one of San Francisco's hills you may feel that if you blink your eyes it will be gone, for it has at that distance an air of unreality. If you are fortunate enough, or wise enough, to see it for the first time at night, you may feel quite sure that it is some new kind of mirage, for bathed in the atmosphere of San Francisco Bay the whole fairyland-like island appears suspended above the sea.

Despite this apparently ephemeral atmosphere the whole island—even the soil—is evidence of the skill and artistry of the creators and designers of today. The architects have so planned the island that the inner courts where fountains splash and the flowers are so breath-taking in their profusion and carefully arranged color masses, are all shielded from possible fog rolling in from the Pacific. The wind breaks are pleasing as well as practical, the long unbroken windowless walls are skillfully illuminated at night, and palm and olive trees silhouetted against creamy stucco provide ideal decoration. The lighting is impressive, particularly the changing flood colors which can but make one murmur



about Northern Lights. Tall columns of light add an Oriental touch, but are definitely American in their efficiency. All the newest fluorescent lights prove their adaptability to even the most untrained layman, and fluorescent paint, too, plays its part much to the wonderment of the uninitiated.

The artists have all had their fling. The colossal figure of Pacifica by Ralph Stackpole which stands eighty feet tall presents the theme of the Exposition, and incidentally is an engineering feat as well as an artistic triumph. The torso and legs were molded on the spot over a framework of steel and metal lath, while the head and hands were cast in the sculptor's studio and then transported to the island and fitted into place. The Peacemakers mural by the Bruton sisters is another modern achievement that interests by the skill of its manufacture as well as by its artistic symbolism. The great panel 144 feet long and 57 feet high is really built up of 270 panels all fitted skillfully together. Other types of murals present striking colors and forms, and lastly and of real significance is the Fine and Decorative Arts building which houses rare old masterpieces as well as the newest and smartest in the decorative arts.

As every new material is shown in its newest and most comprehensive form naturally plastics come into their own. No one can leave the Decorative Arts building without being thoroughly conversant with certain plastics. They appear in many forms, but perhaps nothing attracts the eye more quickly than the "Show Window of the Future" wherein sit, stand and recline manikins created with spirally curved plastic rods for arms and legs. There is a chair, too, that looks quite

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Plastics in their newest decorative forms as seen on Treasure Island include transparent antique library steps, spiral lamp base, waste paper basket, book-ends, serving tray and salad spoon (Figs. 1–6), all of Acrylate (Plexiglas) designed by Dave Swedlow. Light brackets representing Texas long-horn's skull (Fig. 8), and andirons (Fig. 7) simulating cactus plants, designed for a desert living room by William Haines, combine Lucite with silver and glass, respectively

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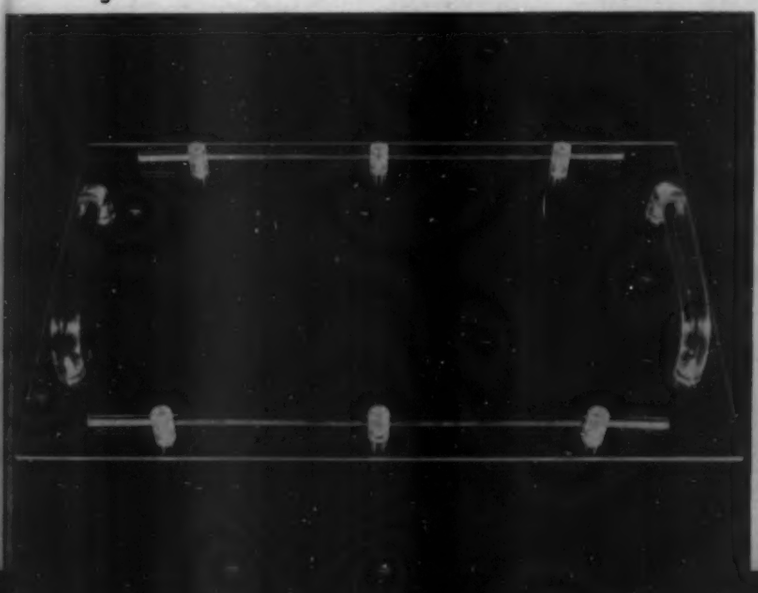

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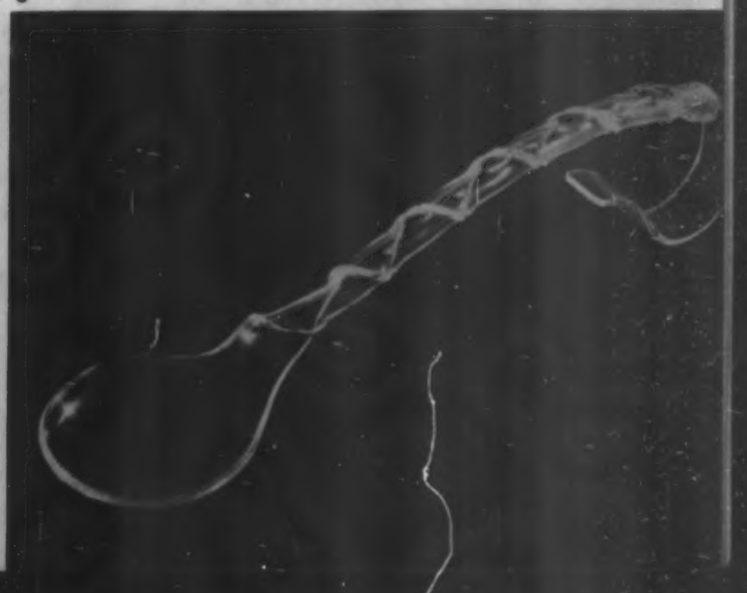

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substantial enough for the bizarre figure sitting on it, but one can but question its use for other than display.

In one of the room settings there are andirons made of clear plastic and glass, light brackets of silver and spectacularly curved plastic rods, and in the same room are heavy disks of clear plastic lighted from below and within which serve as bases for ruggedly carved wooden heads designed by Liza Monk. The light shadows cast up through the plastic add piquancy to the stern Indian faces. Three dimensional abstractions are attracting discussion, for whether one likes the art form or not one can but comment upon this use of plastics.

Clear plastics are in constant use for various types of display—to hold jewelry or silver or ceramics, and they make practically invisible supports for rare Indian treasures in the justly famous Indian Exhibition. They make letters of identification on the exterior of buildings where they can pick up light rays when necessary, and they even make shields for one of the splashing fountains. A small mural of varicolored plastics is featured in one of the commercial displays and several of the artists who have seen it have recognized the possibilities of the material and consequently we may expect other finely conceived artistic expressions as a result. And just as a stunt to impress the public there is a man-made "diamond" some nine inches across. Quite properly plastics have taken their place among the treasures of Treasure Island.

**The pictorial story of the New York World's Fair scheduled for this issue has been postponed because photographs were not available when we went to press.—Editor.**

Fig. 9—Transparent plastic disks are used around the central stem of spiral staircase at the Yerba Buena Club. Indian head (Fig. 10) carved by Helmuth Foth, rests on an illuminated Lucite base which highlights the face. This base tops a spiral pedestal of Joshua wood designed by Liza Monk. Sports terrace designed and assembled by Richard J. Neutra includes a table of chromed metal (Fig. 11) with Formica (Bakelite) top

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Twisted Lucite rods form the body of eccentric manikin (Fig. 14) styled by Helen Cole and executed by Cora Scovil. Decorative lamp stand (Fig. 13) and transparent plastic piping (right in over exhibit, (Fig. 12) are the same material

# NEW MATERIALS IN REFRIGERATORS

**Besides breaker strips, this new model has an inside door panel of laminated phenolic and shelf pulls, outside door handles and thermometer of the new cellulose acetate butyrate plastic**

PLASTICS ARE BEING USED MORE AND MORE IN modern refrigerators. The 1939 Westinghouse household refrigerator has a white laminated panel on the inside of the door, instead of the conventional enameled-steel panel. The advantages resulting from the use of this material are: simplified door construction; better thermal insulation; increased durability; and decreased weight. Plastic materials are used also in four other places. A gray laminated plastic strip is held by stainless-steel retainers between the food liner and the cabinet proper; the temperature control indicator is a disk of molded plastic, as are the door handle, the door latch, shelf pulls and thermometer.

Most remarkable of the benefits of the plastic panel is the simplification in structure. Where before the total thickness of door plus insulation was about $3\frac{1}{2}$ in., it is now only $2\frac{1}{2}$ in.; consequently, the space available for food storage has been increased for a given size of cabinet. The plastic panel is fastened directly to the edges of the press-formed door front by means of machine screws, with the space between filled with insulating material. The heads of the screws are covered by a rubber gasket. On large models the panel is $\frac{1}{16}$ in. thick and "pan shaped," the center being sunk about an inch below the level of the edges, but on smaller standard models the panel is a flat sheet $\frac{3}{32}$ in. thick.

For this use a new grade of laminated material is being produced. It has a solid paper base and a special white surface. Approximate physical characteristics follow:

| | |
|---|---|
| Tensile strength | 8,000 lbs. per square in. |
| Flexural strength | 15,000 lbs. per square in. |
| Compression strength (flatwise) | 35,000 lbs. per square in. |

Samples completely immersed in water for twenty-four hours absorb two or three percent of moisture by weight. The substance has an approximate thermal coefficient of lineal expansion of 8-x $10^{-6}$ per deg. Centigrade with the grain and 23 x $10^{-6}$ per deg. Centigrade across the grain. Its specific gravity is 1.35. Having a Rockwell M hardness of from 100 to 110, the plastic used on refrigerators has a somewhat harder surface than the usual phenolic grades of laminated material.

Laminated plastics in general have a slight inherent tendency to warp; however, the amount and direction of warpage are predictable from the structural characteristics of the laminates, and on a refrigerator door the panel is so designed that any distortion merely improves its contact with the insulating material back of it. The mounting screws are somewhat smaller than the holes in the sheet, so that any distortion will not cause deformation of the door or of the plastic panel itself. In other words, the mounting might be termed "floating."

To prevent contamination of foods by the resins in the panel a special odorless material was derived and is produced by a patented process exclusive with the Westing-

Pure white laminated Micarta panels are fitted to these Westinghouse refrigerators on a separate assembly line

Assemblers attach laminated Micarta strips which are screwed down tightly to hold the food liner firmly in position


Freezer knob, thermometer, shelf pulls and door handles pictured above are injection molded from Tenite II, the new cellulose acetate butyrate plastic

house Company. Unsalted butter placed directly in contact with a sheet of the substance and left at refrigerator temperature for 48 hours showed no trace of phenolic taste or odor. Extended tests have failed to discover any food whose odor permeates the panels of these doors.

The mechanical durability of laminated phenolic material probably is superior to enameled steel for this application. A localized impact will chip enamel, and may even dent the underlying steel. But the plastic panel is resilient and has a tough surface that probably would not be damaged by any impact except a severe blow with a pointed instrument. A 65-gram weight dropped 5 times on a one-inch ball placed on the panel left no impression, but it chipped enameled steel. Chemical and color stability of the material are excellent. It is completely impervious to weak acids and alkalis, and is somewhat superior to ordinary porcelain.

For example, the material withstood the following tests, while ordinary enamels were badly etched.

10 minute exposure in 5% Acetic Acid (Vinegar)
10 minute exposure in 10% Citric Acid (Lemon or Grapefruit)
10 minute exposure in 2% Lactic Acid (Milk)
10 minute exposure in 18% Hydrochloric Acid
10 minute exposure in 1% Soda Ash Solution
10 minute exposure in 20% Caustic Soda Solution

Color stability varies with different pigments. Although white phenolic laminated material may discolor slightly after long exposure to sunlight or ultra-violet radiations, it is perfectly stable under the conditions of household refrigerator operation. During manufacture the color of the panels is matched exactly to the color of standard specimens of interior enameled steel.

Drawer pulls, outside door handles, "freezer" door pull and the thermometer are molded from the new cellulose acetate butyrate plastic. It is claimed that this new material has about the same moisture absorption as nitro cellulose or about half that of cellulose acetate, giving it corresponding resistance to distortion under varying degrees of heat and humidity.

This characteristic is of particular value because the refrigerator interior parts are subjected to temperature changes—varying roughly between 20 deg. F. and 80 deg. F.—and a relatively high humidity. The average cellulose acetate plastic would not have the same dimensional stability under these conditions due to its higher percentage of moisture absorption.

The handles and door pulls are injection molded, two at a time, and the shelf pulls, four at a time. They are made ready for assembly by simply removing gate scrap where the material enters the mold. Injection molding provides for rapid production.

# THE TREND OF COLOR

**There is no place, perhaps, where color is more appropriate and welcome than in the modern bath**

COLOR HAS COME INTO THE HOME AS A natural trend in the choice of those who buy fixtures and equipment because they enjoy color. Not the garrish violent hues some manufacturers produce because they are without taste themselves, but the soft blending colors of harmony that usually distinguish the living and business quarters of discriminating people; or are the result of the fine feeling of fitness which comes from the hand of the trained artist, architect and decorator.

Call it modern or what you will, the bath, which not so long ago was drab and dull, has emerged as one of the most attractive rooms in contemporary apartments and homes. It has been given greater consideration in the matter of design and decoration than any other room with the result that it is more inviting to cleanliness, more efficient, more sanitary, and certainly more attractive than would have been supposed possible years back.

New materials have chipped in their bit. Plastics especially, because they are molded color and can be turned out in more than 200 appropriate shades if that many are required or specified by decorators.

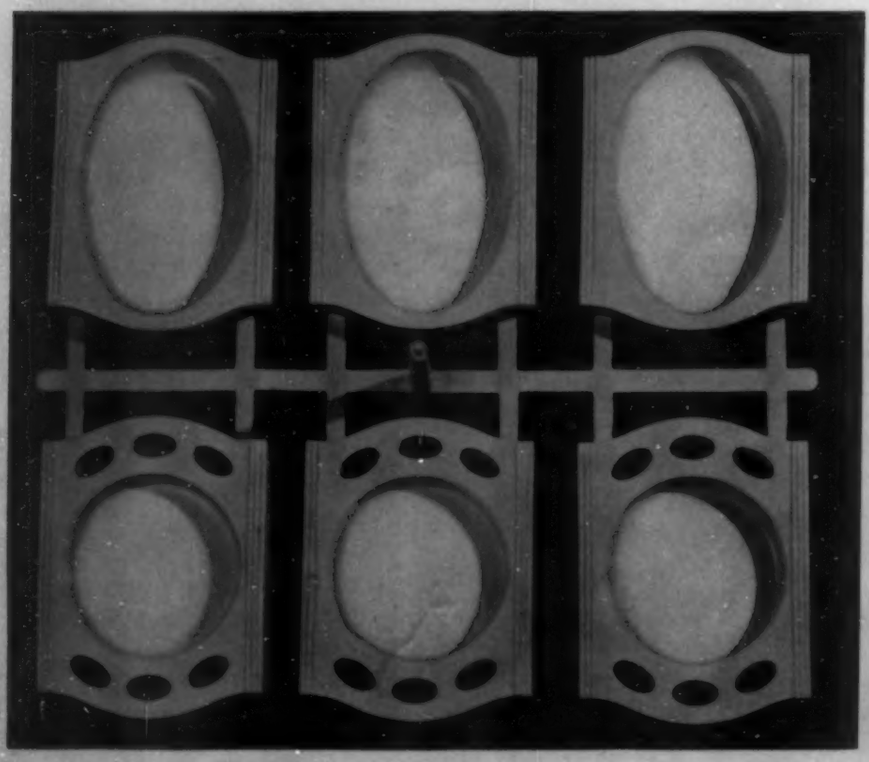
To illustrate this trend, we have chosen examples from a rather complete assemblage of bath fixtures made and marketed by the B. & T. Floor Co. which indicate the production possibilities of injection molding as well as the appropriateness of the materials themselves for bathroom equipment.

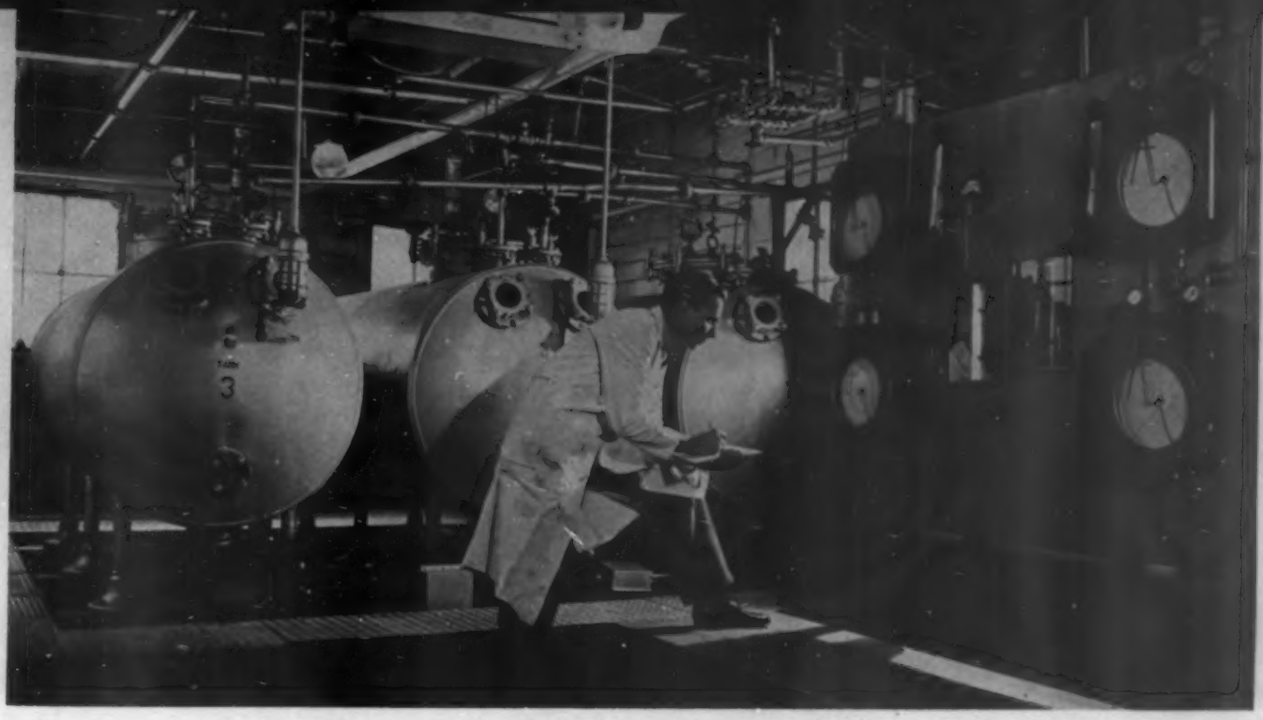
These fixtures include a recessed soap dish and hand bar for over-tub installation, towel bar with molded ends for attaching, over-sink soap dish, tumbler and toothbrush holder, and receptacle for toilet tissue. They are all molded of thermoplastics in which the color goes clear through. They cannot chip nor dent, are easy to keep clean, and present the soft satiny appearance of the tile which surrounds them.

To give you an idea of how they are molded by the injection process, we picture three soap dishes and three tumbler holders (molded six at a time) just as they come from the press. The bars which join them are called sprues and they are clipped off with power cutters which is about the only finishing operation necessary before wrapping them in tissue for shipping. At the right, you see the recessed soap holder and bar handle installed.

This method of molding is especially adaptable to mass production and as soon as builders and home owners realize the economy and permanence of plastic fixtures, no reason will remain why color and pleasing design should be denied any who seek it.

Three soap dishes and three tumbler holders are injection molded in one operation after which they are cut apart and wrapped for shipping. At the right, recessed soap receptacle and bar handle installed. They are attached to the wall by stainless metal clips. Molded of Lumarith by Columbus Plastic Products, Inc., for the B. & T. Floor Company





Receiving tanks and control board used in connection with refining methyl methacrylate monomer, a step in the manufacture of Lucite. (All photos, courtesy du Pont)

# METHYL METHACRYLATE RESINS

by C. M. JOYCE*

**Water clear, these resins must be manufactured under immaculate conditions and with positive control of each operation**

THROUGH THE DEVELOPMENT OF MODERN plastics, products which were no more than chemical curiosities a generation ago have become a commonplace of today.

While it is recorded that Fittig obtained a polymer of ethyl methacrylate as long ago as 1877, the production of polymerized methyl methacrylate and its commercial development are comparatively recent. Modern methods of organic chemistry paved the way for this development, and have made it possible to produce methyl methacrylate monomer in commercial quantities at a low price.

*E. I. Du Pont de Nemours & Co., Incorporated.

Monomer may be defined as a substance consisting of molecules which are capable of uniting with each other to produce larger molecules having the same percentage composition as the original substance. The substance produced with the larger molecular weight is known as polymer. Methyl methacrylate monomer is a clear colorless liquid with a viscosity about the same as that of water and with a pungent odor, having a specific gravity just under that of water, and its boiling point is practically the same as that of water. This monomer polymerizes readily under various conditions which may be regulated to vary to some extent the character of the

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Fig. 2 is the centrifuge where excess water is thrown off and the polymer partially dried. Out of the dryer (Fig. 3) pours Lucite molding powder

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product obtained. In the course of polymerization, the initial free-flowing liquid gradually becomes more and more viscous and then passes over to a gel and ultimately to a rather rigid hard solid.

In the manufacture of rods and tubes, for example, the monomer is weighed into a kettle, wherein it is heated to bring about partial polymerization to a viscous syrup. Then, the amount of catalyst required for the subsequent polymerization is thoroughly mixed with it. The syrup is then run into a multiple mold through a pipe and distributing head. When full, the mold is slowly heated in a hot water bath, and its contents gradually become solid. It is then opened and the finished mass ejected.

If instead of massive resin it is desired to make a finely divided product, the monomer may be polymerized while dispersed in an inert liquid such as water. The monomer is maintained in the form of tiny droplets in the inert liquid, and the polymerization of these droplets results in the production of solid polymer in correspondingly finely divided form. The polymer is then separated from the liquid vehicle and dried. The polymer thus formed can be molded into articles which are completely clear and colorless. In many cases, however, it is desired to modify the mechanical characteristics of the material by the addition of plasticizers, and to produce material of various colors. Plasticizers, dyes and pigments may be added, if desired, either to the above mentioned dispersion of the monomer or to the finely divided polymer on hot rolls. In the latter case, the polymer softens to a dough which is calendered off the rolls in sheets after the auxiliary ingredients are incorporated. The rough sheets are then cut up and reduced to a fine granular form suitable for molding, either by injection or compression.

The applications of methyl methacrylate resins are based primarily on their brilliant clarity which equals or exceeds that of any other plastic, combined with other desirable physical properties such as toughness and rigidity. These properties are displayed by cast sheets, rods and tubes and to a slightly less degree by molded objects. The cast sheets, rods and tubes may be fashioned by sawing, cutting, turning and carving. The thermoplasticity makes it possible to swage and emboss cast sheets.

Methyl methacrylate plastic has attracted the craftsman and designer for hand work such as carved furniture and musical instruments. In colored form the plastic produces various "objets d'art" of striking beauty.

Perhaps the most obvious merit of methyl methacrylate plastic is its extreme transparency. Not only is this the principal factor in the beauty and brilliance of the plastic for many decorative uses, but it forms the basis for certain novel illuminating devices. A particularly interesting use is made possible by the complete internal reflection of light within objects made from the plastic when the surfaces of the objects are highly polished. This property permits the transmission of light from one end to the other of a curved rod or sheet. "Cold light" thus obtained may, by means of suitably shaped rods illuminated at one end, enable the surgeon or dentist to bring strong illumination without heat close to an area upon which he may be operating. Advantage of this same characteristic of the resin is taken in the designing of unique ornamental effects, costume jewelry, etc.

Another characteristic of methyl methacrylate resin which promotes its wide use for decorative purposes is its complete colorlessness. Being colorless and entirely transparent, it may serve to simulate costly rock crystal. Furthermore, methyl methacrylate plastic is free from any tendency to be discolored by even prolonged exposure to strong sunlight. Because methyl methacrylate resin has no color of its own, the resin is capable of coloration of infinite variety by the incorporation of dyestuffs and pigments.

The characteristics of toughness, water, oil and chemical resistance of the material permit it to be used for draft gages, transparent tubes on oil testers and other measuring instruments. The dielectric properties make

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it of value in the electric insulation and instrument field. Radio parts, lighting panels for buses, and elevator signals are made attractively in both crystal and colors.

Highway reflectors molded from this material have proved of recent interest both because of their great aid to night driving and because of the remarkable molding detail accomplished in this product. Smooth on the face but formed into a number of small "pyramids" on the back, the reflectors possess a reflective power many times that of ordinary road side reflectors. Tested first on General Motors proving grounds they have recently been installed on two seventy-mile stretches of roadway in Michigan (MODERN PLASTICS, April 1938). The improvement in decreasing night driving accident rates, aided by these plastic reflectors, has led to its present testing by eighteen other states.

Another development of interest in the optical field is experimentation with this plastic for lenses. These may be molded to the proper size and curvature. They have the unique quality of permitting the passage of nearly all light wave lengths and are accordingly available for spectroscopic work. Low density, lack of brittleness and low relative cost, all favor wider use in various optical instruments and lenses in the future.

Methyl methacrylate plastic in the form of cast sheets is used to replace glass in the (*Please turn to page 74*)

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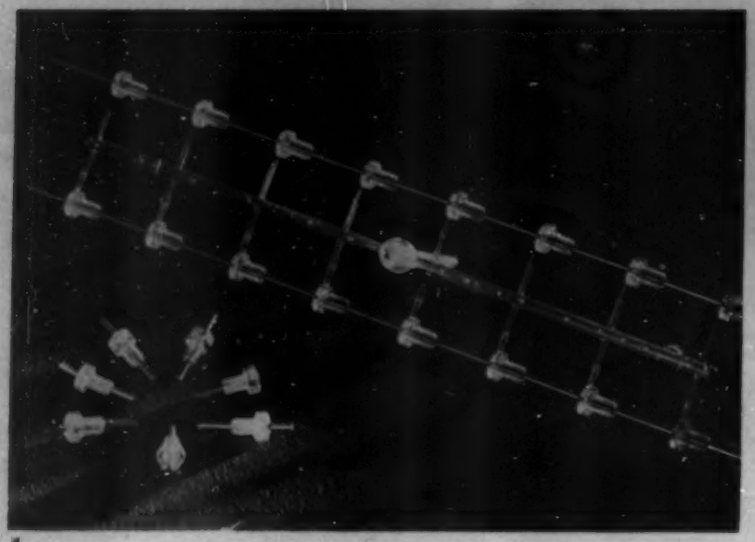
Fig. 4—Fragile in appearance, yet strong and capable of being worked into unusual shapes, methyl methacrylate display fixtures have exceptional power to draw attention to merchandise. Draft gage (Fig. 5) encased in Lucite, is crystal-clear yet practically unbreakable. Decorators' items (Fig. 6) possess charm and resilience unmatched by other materials. They are easily made, as is jewelry pictured in Fig. 7. Domenico Mortillito fabricated this Christmas display (Fig. 8) from sheet Lucite for Elizabeth Arden. A light at the bottom of the piece illustrates the material's ability to illuminate the carvings by edge-lighting. Bag frames, illustrated in Fig. 9, machined from methyl methacrylate give strength, lightness and crystal-clear beauty to these Deauville bags



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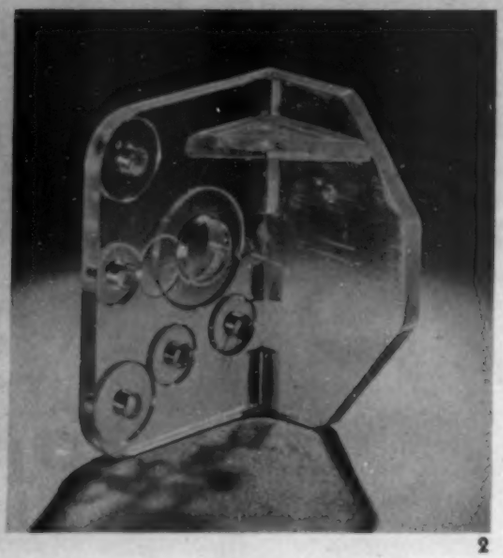

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Transparent bolts, or lead-through bushings, come from the press ready to clip apart and screw in place. At the right you see the bracket with holes molded in for maintaining a coil. Molded of Bakelite Polystyrene by the Thomas Mason Company

# POLYSTYRENE AT WORK

by DON MASSON
BAKELITE CORPORATION

**Superior resistance to moisture makes this plastic an exceptional insulator for short wave circuits**

BECAUSE POLYSTYRENE IS BETTER ABLE TO resist moisture absorption than any other plastic, it becomes tremendously important in the radio and television fields where short wave control is difficult and essential. The water absorption rate is an extremely important factor. Many insulators are excellent as long as they are kept free from water but become useless when exposed to moisture for any period of time. Recent tests show that a $2\frac{1}{2}$ in. disk molded of a common formula of styrene resin picks up but 0.05 percent moisture by weight after a total immersion of 318 hours.

To further illustrate this significant fact, the insulation value of this material is still greater after 100 hours' immersion than that of general purpose phenolic molding compound in its original state ready for installation.

Add to this the several other advantages possessed by this resin, such as low power and loss factor, dielectric strength, chemical resistance, mechanical properties, transparency, hardness and permanence of dimension, and you have a fairly clear picture of its importance to the electrical industry. Furthermore, it is a thermoplastic capable of injection molding which means rapid, automatic production in molds requiring small investment.

Before detailing these properties at greater lengths, let's see how the National Company puts polystyrene to work in its short-wave transmission receiving sets (Page 68). Perhaps the neatest trick of this assembly is shown in Fig. 1 where sixteen lead-through bushings are injection molded at one time, coming from the press with hexagonal heads and threads, as well as lead-through wires all molded in place. All that remains to ready them for installation is to clip the continuous wire midway between bushings and screw them in place. Circuit wires are then soldered to the extending ends.

Material costs are kept at a minimum in this manufacturing process because the sprue and gate material which are carried through to individual parts need only be ground up into molding powder to be used again. There is no waste in this transparent thermoplastic because it may be reground and remolded time and again with no loss of its physical properties, and there is no unusable flash.

The angle bracket (Fig. 2) which is clamped to the set in final assembly, is used as a coil mounting where considerable difficulty was experienced in the past through electrical losses. Other materials proved too brittle and were inclined to crack when the unit was finally assembled.

Besides the angle bracket in Fig. 2, we picture a coil insulator, tube bases and mountings molded of styrene which render useful service in the National Company's set. The choice of the material was based upon its unique properties of moisture resistance, electrical resistivity, appearance and simplified production.

Although polystyrene is a thermoplastic which may be softened and distorted at (*Please turn to page 68*)

# ANNOUNCING FOURTH ANNUAL MODERN PLASTICS COMPETITION

**MODERN PLASTICS COMPETITION HAS BECOME A NATIONAL INSTITUTION DURING THE past three years. It represents the single concerted effort of the Plastics and allied industries to assemble a Public Exhibit which forcefully demonstrates the progress made each year through the creation of new plastic materials and improved methods of handling them.**

**More than this: The Competition serves to reveal the best efforts of designers and engineers to make use of plastics in economical, practical and unusual applications in daily production.**

**Our readers have learned to depend upon MODERN PLASTICS COMPETITION as a prime source of visual information to guide them in their own choice of plastic materials and to enable them to choose the particular properties of the various types best suited to their use, which are clearly shown in this annual exposition.**

**Due to the natural process of growth, certain changes become necessary in the operation of the Competition from time to time but the original purpose—"To bring together once a year the best products of the plastics industry in a public exhibition"—remains unchanged.**

**One requirement this year, in connection with architectural entries, is that photographs submitted must be accompanied by actual samples of the plastic material in order to show color and texture to enable the judges to pass upon its merits as an application.**

**No basic change in the manner of judging has been made this year but a few changes from the practice of former years will be found in the nature of the awards. Whereas formerly first, second and third awards were made in each division, it has been decided to make three awards of equal standing within every division. The decision was induced by the fact that engineering and appearance design, as well as practicality of the plastic applications, have advanced to a point where such refinements of judgment as are indicated by a first, second and third distinction can no longer be practicable. Therefore, taking three awards per division as a desirable goal, the judges will be free to enlarge or reduce this number according to the standards of excellence in any group.**

**There are eleven groups this year instead of five. Additional groups were set up in order to bring equal prominence to molding, laminating and casting under the Industrial and Decorative divisions. Style, which was omitted last year, is reinstated because of renewed interest and activity in this field. This year's classifications follow:**

1. **Industrial Parts, Molded**
2. **Industrial Parts, Laminated**
3. **Industrial Parts, Cast**
4. **Decorative Products, Molded**
5. **Decorative Products, Laminated**
6. **Decorative Products, Cast**
7. **Household**
8. **Scientific**
9. **Transport**
10. **Style**
11. **Miscellaneous**

**If any of the above groups do not have sufficient entries to constitute competition on the closing date, they will not be judged. Further details will be found on the next page and in the Entry Form following.**

**Winners in the 1939 Competition will be included in a motion picture with sound and color which will carry their story of merit to the ends of the land. Our film, "Modern Plastics Preferred," showing 1938 winners, is in constantly increasing demand by business organizations, colleges, clubs, in nearly every state.**

**So, for the fourth consecutive year we invite you to take full advantage of the educational and promotional opportunity offered through Modern Plastics Competition by making as many entries as you care to submit. There is no entry fee. No obligation whatever.**

# DETAILS OF MODERN PLASTICS COMPETITION

**It started** in 1935 with 256 entries and was visited by nearly 500 people during the six weeks' exhibit. It has grown each year, the number of entries last year exceeded 1000 and more than 6000 visitors came to see the display during the six weeks it was shown in our offices.

**Who sponsors it?** The Competition was inaugurated in 1936 by MODERN PLASTICS which underwrites, all expenses involved in the classification of the awards, the cost of the awards, and the sound and color motion picture which tells the story of plastics and pictures the winners in an educational and entertaining manner.

**Who judges it?** A board of judges representative of the viewpoints of the consuming manufacturer, industrial designer, engineer, decorator and architect, who serve without compensation and work without restriction.

**Who may enter?** Entry is open to all designers, engineers, molders, laminators, fabricators, sponsors and materials manufacturers. Entries may be made also by machinery and mold manufacturers whose equipment is used in any way in the production of the entered part.

**What may be entered?** Any object or product designed or placed on the market since September, 1, 1938 in which any sort of plastic material is a component part.

**Any restriction on entries?** Any firm or individual may make any number of entries within the single limitation stated above.

**What rewards for the winners?** First: The MODERN PLASTICS Plaque of Award—three given in each of the eleven groups. Second: A distinction which most winning sponsors have capitalized to consumers and dealers through every possible advertising medium. Third: Publicity for product and maker through articles and pictures in hundreds of journals, newspapers, motion pictures, traveling exhibits, etc.

**Are there any charges?** There is no entry fee nor any other charges whatsoever upon either entrants or winners. All expenses are borne by the sponsors, MODERN PLASTICS.

**How are entries made?** All entries should be sent prepaid to MODERN PLASTICS COMPETITION, 122 East 42nd Street, New York, N. Y., accompanied by the entry form opposite. One form required for each entry. Additional entry forms will be sent upon request.

**When does the contest close?** Last day for entries is September 23, 1939. Judging takes place immediately. Announcement of the awards will be made in the November issue of MODERN PLASTICS.

BE SURE AND FILL OUT BACK OF THIS ENTRY BLANK

## CLASSIFICATIONS

1. ☐ Industrial Parts, Molded
2. ☐ " " Laminated
3. ☐ " " Cast
4. ☐ Decorative Products Molded
5. ☐ " " Laminated
6. ☐ " " Cast
7. ☐ Household
8. ☐ Scientific
9. ☐ Transport
10. ☒ Style
11. ☐ Miscellaneous

(See classifying descriptions on opposite page)

TEAR HERE

| | |
|---|---|
| 1. Name and address of company using plastic application. | |
| 2. Name of entry submitted. | |
| 3. Name and address of designer of entry. | |
| 4. Name and address of manufacturer of plastic materials used in entry. | |
| 5. Name and address of manufacturers of molds, machinery and equipment used in production of entry. | |
| 6. Name and address of molder, fabricator or laminator of entry. | |

7. On the reverse side of this sheet summarize in approximately 200 words the reasons behind the design and construction of the product entered, what was sought and how it was accomplished, with, if possible, a statement of the resulting manufacturing economies, improved performance and increased sales.

NO ENTRY FEE REQUIRED

FROM _____

_____

_____

# TO MODERN PLASTICS COMPETITION

CHANIN BUILDING, 122 E. 42nd STREET, NEW YORK, N. Y.

GROUP No. _____

## *Read Carefully Before Filling Out Blank*

WHAT MAY BE ENTERED: Any plastic application which has been designed or has reached the market since September 1, 1938.

WHO MAY MAKE ENTRY: Entry in Modern Plastics Competition is open to all plastic-using firms, designers, molders, laminators, fabricators, materials suppliers, machinery and die makers, and to others responsible for the creation or manufacture of the plastic unit entered.

NO ENTRY FEE: There is no entry fee but it is understood that all entries are to be submitted complete and in good working order and will remain the property of MODERN PLASTICS, to be placed in the permanent exhibit maintained at its offices, 122 East 42nd Street, New York City.

*We are not responsible for breakage or pilferage and will do our best to return merchandise after the exhibit only if requested by special arrangement at time of entry, and if your company agrees to pay the packing, labor and cartage costs. Incomplete entries, such as empty housings, will not be judged.*

CLOSING DATE: All entries must be in our offices on or before September 23rd, 1939, regardless of the postmarked date.

NUMBER OF ENTRIES: Any number of different entries may be submitted by any firm or individual.

ONE BLANK PER ENTRY: If you are planning to enter more than one plastic product or part, write now to MODERN PLASTICS for additional entry blanks. A separate blank should accompany each entry except where duplicate items are submitted to show color range or where several items are to be grouped and judged as one, such as a set of jewelry, condiment sets or other similar groups.

FULL INFORMATION: No entry will be accepted for judgment unless accompanied by a completely filled out and detailed entry blank which has been signed both with the company and individual name.

WINNERS: To be announced in the November 1939 issue of MODERN PLASTICS Magazine. Awards will be made in accordance with plans to be announced at that time.

## MAKE CERTAIN OF THE CLASSIFICATION OF YOUR ENTRY

It should be clearly understood that these classifications are made as a means of group division to facilitate judging. Each entry will be judged in its entirety, taking into consideration all the inherent factors of engineering and surface design which determine its advantages as a plastic application.

Modern Plastics reserves the right to switch entries to their proper groups if they have been wrongly classified or to set up new classifications if enough entries warrant such procedure. Eleven groups have been provided for the 1939 Competition.

1. INDUSTRIAL PARTS, MOLDED: All kinds of molded plastic parts used in industry and not otherwise classified by the following groups.

2. INDUSTRIAL PARTS, LAMINATED: All gear blanks, bearings, helmets, spools, bobbins, and other items used in industry, as opposed to panels, etc., used for decoration which are classified in group 6.

3. INDUSTRIAL PARTS, CAST: All cast plastic parts of any generic group which find their ultimate use in industry.

4. DECORATIVE PRODUCTS, MOLDED: All molded plastic merchandise used by decorators or home makers such as lamps, shades, colored telephones, radios, curtain rods, ends, pulls, etc.

5. DECORATIVE PRODUCTS, LAMINATED: All screens, blinds, transparent, translucent, opaque panels used for decorative or architectural applications. Laminated shades, table tops, bars, etc.

6. CAST, DECORATIVE PRODUCTS: All merchandise cast either direct to form or fabricated from cast shapes such as cast radio housings, statues, book ends, lamp bases, tables, chairs, etc., used primarily for decoration. (Exteriors of buildings, ships, etc., may be represented by photographs but unless accompanied by some form of sample to indicate the material and color scheme, the judges will have nothing tangible on which to base a decision.)

7. HOUSEHOLD: All other plastic merchandise whether molded, laminated or cast intended for utilitarian purposes in the mechanics of the home. This group includes dishes, electrical appliances, tableware and cooking utensils, with handles and other component parts which are made of plastics.

8. SCIENTIFIC: All applications of plastic materials to the advancement of science and scientific instruments whether simple or complex. Cameras, medical instruments, measuring devices, thermometers, lenses, etc.

9. TRANSPORT: All plastic parts used in the construction and operation of trains, planes, buses and motor cars.

10. STYLE: All plastic merchandise created for personal adornment or to be carried or worn. Shoes, jewelry, compacts, purses, cosmetic containers, umbrellas and canes. (This group was included with Novelties last year but interest indicates that it should be re-established for 1939).

11. MISCELLANEOUS: All entries which cannot be properly classified in one of the foregoing groups will be judged under this classification.

If any of the above groups do not have sufficient entries to constitute competition on the closing date, they will not be judged.

FOURTH ANNUAL MODERN PLASTICS COMPETITION

Sponsored by MODERN PLASTICS

# ENTRY FORM

**Entries Must Be Received by SEPTEMBER 23, 1939**

BRESKIN & CHARLTON PUBLISHING CORP.
CHANIN BUILDING • 122 E. 42nd STREET, NEW YORK, N. Y.

# FOURTH ANNUAL MODERN PLASTICS COMPETITION

Sponsored by MODERN PLASTICS MAGAZINE
BRESKIN & CHARLTON PUBLISHING CORP.
122 East 42nd Street, Chanin Building, New York, N. Y.

**NOTE:** Please include on this sheet a summary, of approximately 200 words, in which will be stated the objectives of the plastic application entered, what was sought and how accomplished, with, if possible, a statement of the manufacturing economies, improved performance and increase in sales.

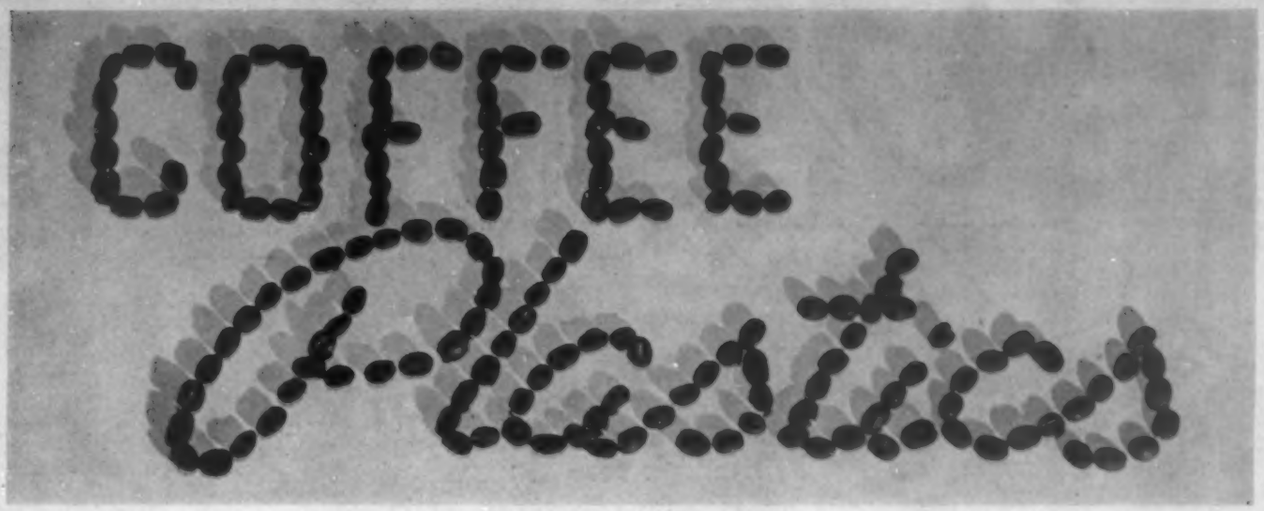
TEAR HERE

SUBMITTED BY: (Give Company Name) _____

INDIVIDUAL HANDLING ENTRY _____
(I have read the conditions of the MODERN PLASTICS COMPETITION and hereby agree to them)

ADDRESS _____

DATE _____




by ALBERT GRAY*

**Research provides South America with a new plastic produced entirely from a surplus agricultural crop**

IN THE DAYS WHEN A CADDY HAD SOMETHING to do with the keeping of tea rather than with the losing of golf balls, a "coffee cup" that merely held coffee may have been all right: now, with the development of a plastic made from the green coffee bean, it seems that a real coffee cup must be made of coffee. You may soon walk into a coffee house (of coffee), sit down at a coffee table (made of coffee), drink coffee from cups of coffee, and eat from coffee dishes, surrounded by coffee furniture and decorations, and entertained from a radio housed in a coffee cabinet. You may, that is, under the plan to supplant for Brazil its burning and dumping of four million or so bags of coffee a year by the production of the coffee plastic recently developed for that country by the H. S. Polin Laboratory for Research in Physics of New York.

Although this new plastic is intended to be produced only in Brazil or other South American countries having an excess of coffee (the cost of importing the coffee probably making it non-competitive with plastics of this country), it has several characteristics which make it of especial interest to science and the plastic industry. Of major importance to the countries in which its development is projected, is the fact that its production can be practically a self-contained industry. Plastics have not come into wide general use in South America because of the high cost of importing raw materials. But with warehouses full of coffee in excess of that which is required for beverage purposes, it will not be necessary to import large amounts of chemicals and reagents for the manufacture of plastic materials. The chemical reagents—the plasticizers and catalysts necessary to form a plastic—are contained in the coffee itself. It can literally be made to plasticize itself. Not only that, but coffee has been found to contain its own dyestuffs, and it can be produced in a hard, highly polished material colored dark green, brown, red, mahogany, yellow, ebony black, and other colors without the addition of any foreign coloring material. It can be made in either a thermosetting or a thermoplastic type, depending on the manner in which it is treated with its own various chemical constituents, such as the tannins, aldehydes, hydroxy compounds, and nitrogenous materials contained in the complex coffee bean. It is highly wear-resistant (hence well adapted to flooring), having been found superior to wood, cork, or rubber, and comparable to the finest quality linoleums. It can be drilled, machined, or sawed, and takes a high polish.

The by-products of coffee plastics manufacture are also of interest. Where coffee is sold as a beverage, it is too expensive to use as a source for its valuable chemical materials, but when these elements are left-overs in the production of a new material, they can become very important. Coffee oil, for instance, is a by-product in making certain forms of the coffee plastic, and it is an oil which can find many important uses. It is richer in analysis than typical vegetable oils, and since it contains vitamin D, it should find many uses in cosmetics, lotions, medicines, and fine-quality soaps. It can be used as a paint oil or as a cooking oil. The laboratory has also identified an element in coffee which has superior emulsifying properties, valuable to chemists and chemical manufacturers, and another element which is unusually powerful in producing colloids, valuable also in the same fields. And of course, coffee is a prime source of caffein, valuable in medicine and pharmaceutical fields. All these products are made available with the putting to work of the complex chemistry of the coffee bean outside of the beverage field.

The different applications of the plastic which may be produced from coffee have not yet been determined. It is known that one type, as mentioned previously, hardens under heat—another type softens and can be molded when heat is applied, becoming very hard on cooling. Tests on the various chemical (*Please turn to page 72*)

* H. S. Polin Laboratory.

# *Smooth and*

A business machine older than the motor car finally acquires streamlined youth and beauty. More compact, more attractive, lighter in weight, more efficient than the old crank operated type, this new Portable Autographic Register, in its handsome case of molded Plaskon, now makes its bid for increased sales.

The designers and manufacturers of this modern sales recording device are Krauth and Benninghofen, Hamilton, Ohio. For more than fifty years this concern has made autographic registers for the important producers of the printed forms that are used in these devices.

Molded Plaskon is ideal for an application of this kind. Its surface is smooth and warm to the touch—pleasing to the hand that speeds the pencil across the printed form. Plaskon has great strength—resists breakage. It will not chip, rust, corrode or tarnish. And because it is solid molded color, the finish is permanent. Scratching or abrasion do not impair its color value. Plaskon is a sanitary material, as well. It is tasteless, odorless, inert. The surface is hard, easy to clean. Plaskon resists solvents—is impervious to oils and greases —a perfect material for the autographic register, which is sold extensively to food shops and hospitals.

Plaskon offers an unlimited range of clean, clear, fadeless colors. They are available from purest white through dainty pastels and brilliant hues to jet black—and from a high degree of translucence to complete opacity.

The many advantages that Plaskon possesses have made it the world's largest selling urea formaldehyde plastic. Why not consider it in your program of product improvement? Plaskon offers you unusual facilities for research, design and engineering. Consultation on any phase of your problem entails no obligation!

**PLASKON COMPANY**

Incorporated

2121 SYLVAN AVE. TOLEDO, OHIO

*Canadian Agent:* Canadian Industries, Limited, Montreal, P. Q.

# *Warm to the Touch!*

*Portable Autographic Register manufactured by Krauth and Benninghofen, Hamilton, Ohio for The Miami Systems Corporation, Cincinnati, Ohio and The National Carbon Coated Paper Company, Sturgis, Michigan. Plaskon case (in ivory with yellow trigger handle) was designed by Russell S. Katz of Krauth and Benninghofen. Plaskon Moldings made by Reynolds Molded Plastics, Cambridge, Ohio. Made in two sizes: 6⅛" wide, 13" long, 3¼" high, and 8½" wide, 13" long, 3¼" high. Weight of Plaskon molded top (small size) 11 ounces, (large size) 13 ounces.*

Trade Mark Registered

# PLASKON

★ MOLDED COLOR ★

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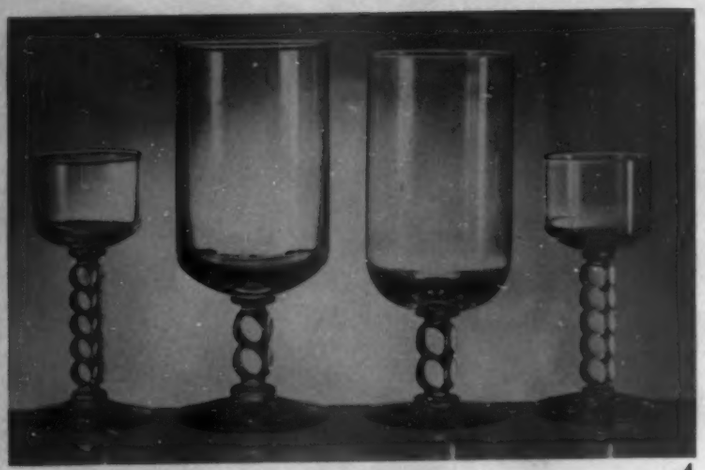

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# Plastics In Review

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1. Shimmering with reflected light, elegantly smart, this crystal-like necklace is made of transparent colorless Plexiglas. Brilliantly clear, unbreakable, it is lighter in weight than ordinary glass. Röhm and Haas are exhibiting it currently at PEDAC, Radio City

2. One at a time, a unique patented device, propelled by thumb and finger, dispenses the contents of a non-spillable, transparent, purse-size container. Refillable, it holds a dozen tablets. Brisbane Box Corp. manufacture the box of Bakelite polystyrene

3. Chieftain, electric clock made by the Pennwood Co. has a Durez case molded by Bridgeport Moulded Products Co. Black finish, practically scratch-proof, contrasts with white numeral wheels for better visibility. Ribbing on each end lends a light modern touch to a severe, simple design

4. Can you guess which? Two of the pieces shown are models carved from Lucite by Richard B. Brigham for Libbey Glass Co.; the other two are actual glasses developed from the exact dimensions of the models. (P. S. Plastic pieces are at right of picture in case you want to know)

5. Ash tray in Bakelite, Resinox or Durez with Trylon and Perisphere embossed commemorates the New York World's Fair. It is available from the Accurate Molding Corp. as a stock mold item in any quantity

6. Dainty, serviceable tea strainer, molded of Beetle by Mack Molding Corp. fits into a cup-like base which catches overflow and prevents dripping when not being used

7. Elmer E. Mills Corp. designed this attractive, serviceable whisk-broom for Rich and France Co. Handles in various colors are injection molded of Tenite, a cellulose acetate material

8. Realistically modeled in miniature from solid blocks of colorful Catalin, and suspended from the ends of gay, twisted silver cordings, these clever Light Pulls are offered by La Mode Plastic Co. Dumb-bell, made by the same company, is combination salt and pepper shaker fabricated in color with translucent ends

9. Bread goes in here and toast comes out—there! The Crocker-Wheeler Toast-O-Lator automatically delivers toast from the end opposite that where slice is inserted. Chromium section is streamlined to fit black Bakelite base, molded by Northern Industrial Chemical Company

10. Completely molded of Durez and Tenite, both resistant to ink chemicals, Esquire Pen-Ink Co.'s inkwell set is ornamental and efficient. It is designed to use one standard brand of ink, precluding the possibility of mixing writing fluids, and features a patented ink control. Windman Bros. molded Durez parts

11. Cologne bottles stand at attention, each secure on a step which is hollowed out to exactly fit the base of the bottle. Mack Molding Corp. made this ivory Beetle display stand for Yardley & Co., Limited

12. Practically unbreakable and with oil supply always visible, new Kleervue cans are made in clear, blue, green and red transparent Tenite. Model illustrated is molded by Bridgeport Moulded Products, Inc., for Neora Manufacturing Company

**Many of these items and others pictured throughout this issue are on display in our editorial offices during this month**

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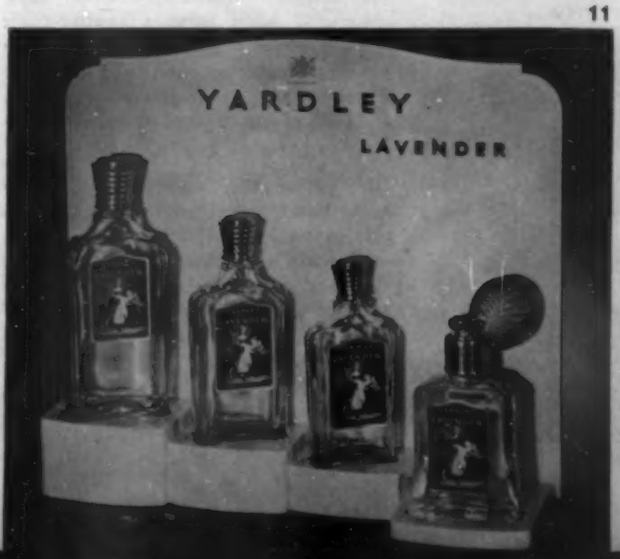


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13. Ultimate in comfort is this energy-saving combination cigaret holder and ash tray molded of black Durez by Jos. Stokes Rubber Co. It is approximately 3 1/2 in. long and very lightweight. Holder unscrews from main body of the unit, which is fitted with hinged, snap-fastening chromium lid for easy ash removal. Top of body has large holes for air or release of idling smoke

14. Handsome fluted humidor, marketed by New York Merchandise Co. achieves visibility of contents through use of a transparent phenolic Bakelite, molded by Universal Plastics Corp. in amber and other gem-like colors. Reenforced lid and base, plus moistened sponge placed in knob at top, help to keep cigarets fresh.

15. To counteract the lip-stick menace, expensive headache of women's apparel merchants, comes Kover-lips, an ingenious, sanitary lip mask. Tab inserted between the lips shields both make-up and clothes. Made of water-repellant paper, they are dispensed from Bakelite container. Molded black plaque has instructions in red and white lettering

16. Using a sliding top, Plasticase eliminates hinges and cloth covering for spectacle cases. Plastics, Inc., injection molded these of Plastacele in varicolored, mottled, translucent effects for Zylocase Co. Lightweight, yet strong, they may have dispensing optician's name printed in gold or silver on the top of the case

17. Handy, brightly colored tape measures with button spring-back device, add inches to sales charts as premiums or promotional souvenirs. Advertisements can be stamped on one side of case. Bastian Bros. manufacture these of Tenite

18. Adjustable, clamp-type utility lamp has a swivel spring device which allows the light to be directed upward, downward or sideways. Bell-shaped Beetle shade with border design was molded by the Waterbury Button Co. for [the] Eagle Electric Manufacturing Company

# Plastics In Review

20

19. Hand-carved, facsimile signs, suitable for show windows and counter displays are carved from Lumarith in many colors. They are easy to clean and practically featherweight. Distributed by Otto Lorch

20. Replica of Agfa film carton is faithfully reproduced on this diamond shaped Durez ash tray with a lacquered decalcomania realistically covering molded-in box. Molded in blue to match the color of the box, by Mack Molding Company

21. In order to show the mixing action of the blading arrangement in the Rex Moto-Mixer, the entire center section has been cut away and replaced with Plexiglas. Demonstrated with colored sponge balls for mixing by Chain Belt Co. at trade exhibitions.

22. Designed especially for motorists and now offered as accessory equipment in colors to match other interior fittings of the same material, Beauty-Lite make-up mirror is enclosed in Tenite, injection molded in three parts by Thermo-Plastics, Inc. Assembly is accomplished by merely fitting parts together—no screws or other attachments required

23. "Tandem" tester, sampling device sponsored by Coty, Inc., consists of three parts injection molded of Monsanto C. A. by the Mack Molding Corp. Rouge compartment disk, with identification stamped in gold roll leaf, and slip cover are of transparent plastic. Molded red lip-stick holder fits into case so fastened to base of tester to permit its pivoting to any angle desired for demonstration

24. Modern, decorative coffee table of transparent colorless Plexiglas is on display at PEDAC, Radio City. One sheet of this clear lightweight plastic, heated and bent, is used as a base. Rectangular piece, more than an inch thick, forms the top of the table

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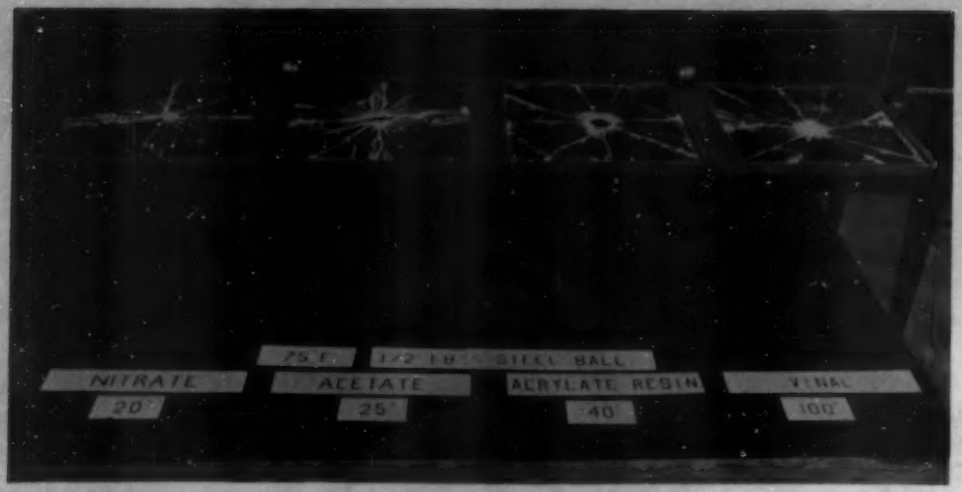
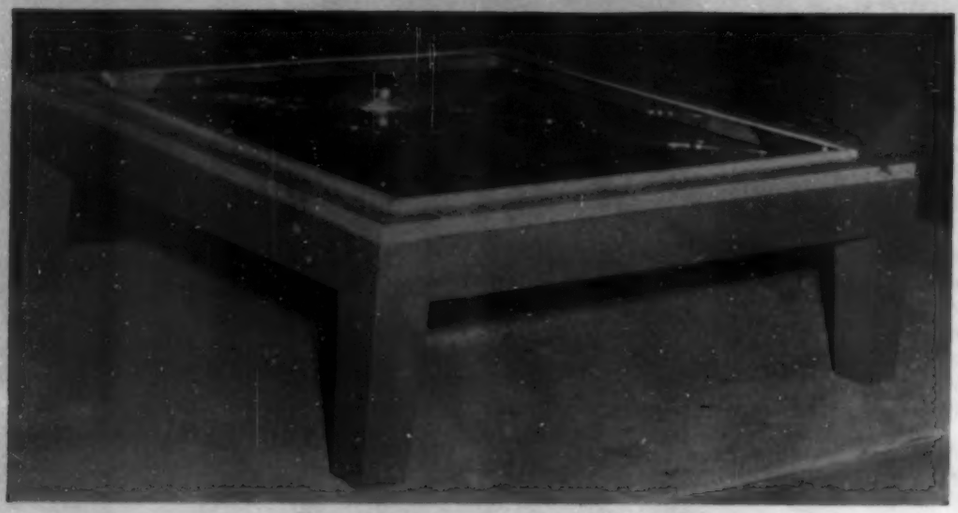
**Manufacturers addresses will be sent if you will write to the Editor enclosing 3-cent stamp for reply**



Comparative strength of safety plate glass fillers in ball-drop tests is shown at top left. Note extreme right pane is not pierced. Photo below was taken a split second after ½ lb. steel ball dropped 82 ft. on a 36 in. square, reinforced with polyvinyl acetal resin

# SAFETY SANDWICH

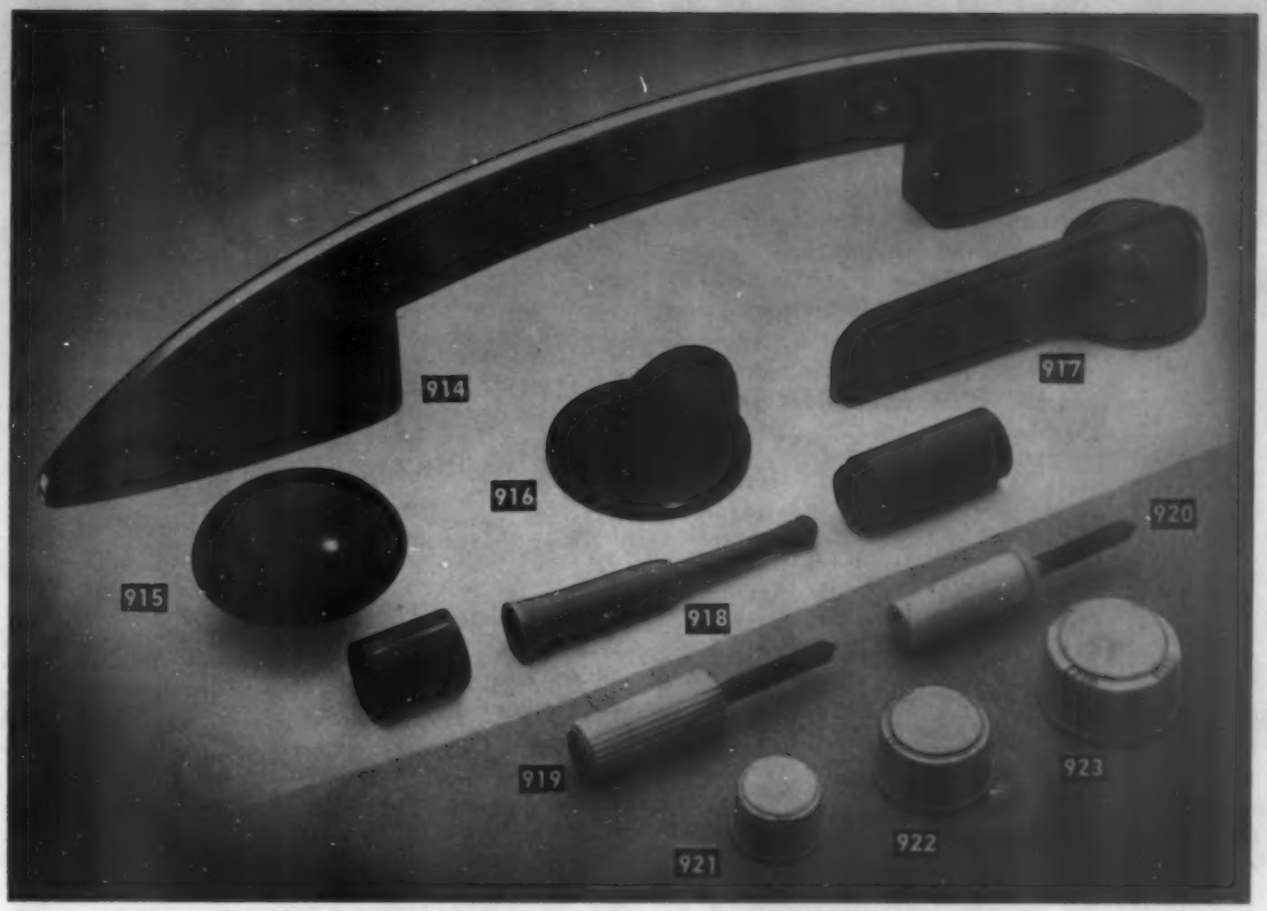
**Polyvinyl acetal resin as an interlayer for safety glass has brought that safety factor to a high degree of perfection**

CLIMAXING SIX YEARS OF EXTENSIVE RESEARCH, polyvinyl acetal resin as an interlayer for safety glass made its debut in Philadelphia, on March 31, when it was accorded formal recognition by the Franklin Institute. The tribute, ordinarily reserved for individual achievement in the field of pure science, was paid to the research staffs of five American companies who spent $6,000,000 promoting its development.

The new member of the far-flung family of plastics makes possible an automobile safety glass that is several times stronger, yet more flexible when broken than any previously developed safety glasses. According to production plans of the manufacturers, high-test glass will be available to all car manufacturers at no additional cost, and in sufficient volume to serve approximately 75 percent of automobiles manufactured this year.

Although auto owners generally have felt that the automobile glass situation had been pretty well solved in the last four or five years—with elimination of the discoloration trouble and extension of safety plate "all around" as standard equipment—glass technicians and chemists felt that the glass could be made more resilient, and that it could be made so that the plastic filler would not become brittle at low temperatures. These are the improvements that are incorporated in the new glass.

At an afternoon session in the Institute's lecture hall Dr. Edward R. Weidlein, director of Mellon Institute, reviewed the history of automobile safety glass and Dr. Nicol H. Smith, associate director of Franklin Institute in charge of chemistry, conducted a series of tests demonstrating the unusual shatter-resistance of the new high-test product at all temperatures, (*Please turn to page 70*)




**Reprints of sheets One to Fifty-Two—in book form, 25¢ in coin or stamps**

# STOCK MOLDS

## SHEET SEVENTY-SEVEN

**Handles, push buttons, knobs and a novelty cigaret holder are available without mold cost from stock molds. When requesting details please mention item and sheet number**

---

**914.** Oven door handle, 11 in. overall length with 5 1/2 in. or 8 1/2 in. hole centers. Furnished in black or colors with chrome inlay or painted stripe

**915.** Round knob, 1 5/8 in. in diameter with 1/4 in. metal stud for attachment

**916.** Gas valve handle, 1 9/16 in. in diameter at base. Furnished with or without shank

**917.** Knob, 39/16 in. overall length. Round end measures 1 1/4 in. in diameter and has a 1/2 in. opening underneath for assembly

**918.** Cigaret holder 2 1/2 in. long with collapsible stem. Fits into one or two-color case which is 1 7/8 in. long and 1/2 in. in diameter. Case may be used separately as a container

**919.** Fluted push button for radio station selector tab, 1 1/16 in. long and 7/16 in. in diameter. 1 in. threaded metal insert

**920.** Plain push button, 1 1/8 in. long and 3/8 in. in diameter at top with base collar 1/2 in. in diameter. 1 in. threaded metal insert

**921.** Knob, 5/8 in. in diameter and 7/16 in. high; 1/4 in. "D" opening for attachment

**922.** Knob, 3/4 in. in diameter and 1/2 in. high; 1/4 in. "D" opening for attachment. Word "volume" in gold letters

**923.** Knob, 1 in. in diameter and 9/16 in. high; 1/4 in. "D" opening for attachment

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**Address all inquiries to Stock Mold Department, Modern Plastics, Chanin Building, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits**

# STOCK MOLDS

## SHEET SEVENTY-EIGHT

**Decorative and utilitarian objects as the condiment set, shaving bowl, picture frame, napkin ring as well as a variety of knobs and machinery pieces are available from stock molds. Molders' names and addresses will be supplied on request. Give item and sheet number**

---

**909.** Salt and pepper shakers 3 5/8 in. high, 3 in. wide and 1 5/8 in. deep. Metallic letters, "P" and "S," attached to the front identify each. Revolving disk near the base for refilling closes to prevent spilling. When not in use may be arranged parallel for decorative effect

**910.** Shaving bowl 1 1/2 in. high (cover and base), 3 1/2 in. in diameter at top and 2 1/2 in. at base. Available to soap manufacturers as container and attractive re-use item. Comes in black and light colors

**911.** Knurled knob 13/16 in. in diameter and 1/16 in. high. Assembled with springs for attachment to 1/4 in. "D" shaft

**912.** Knob 1 1/8 in. in diameter and 11/16 in. high with word "volume" impressed in gold letters. Assembled with spring for attachment to 1/4 in. "D" shaft

**913.** Fluted knob 1 1/6 in. top diameter and 5/8 in. high. Assembled with spring for attachment to 1/4 in. "D" shaft

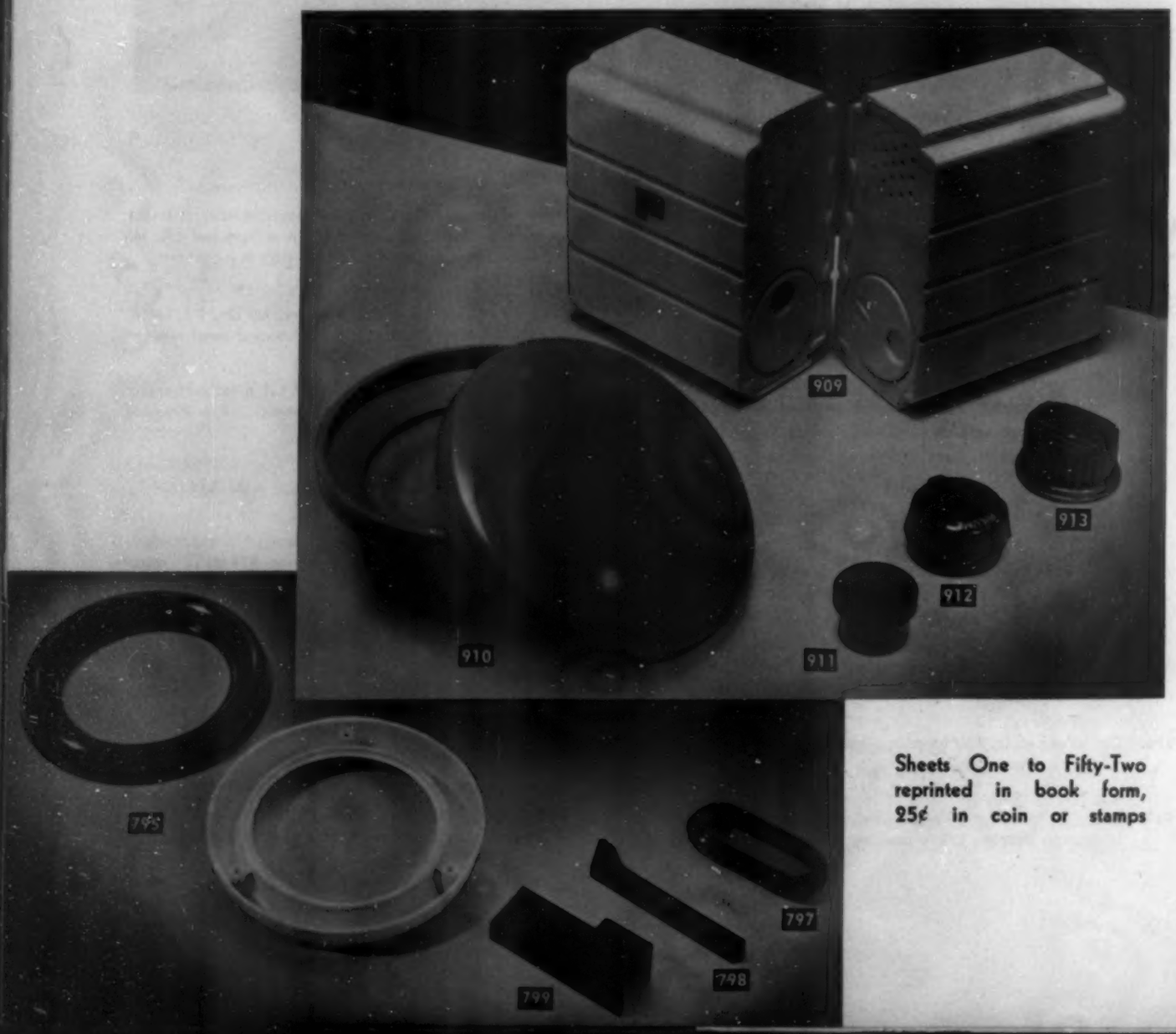
**795.** Picture frame, 1/2 in. deep by 4 1/2 in. outside diameter by 3 in. opening for picture. Molded with hollow shell in which there are three threaded lugs so that picture back can be easily fixed in place

**797.** Napkin ring, inside dimensions 3/8 in. by 3/4 in. by 1 7/8 in.

**798.** Plastic feeler for textile looms

**799.** Cloth ball for textile looms

**Address all inquiries to Stock Mold Department, Modern Plastics, Chanin Building, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits**




**Sheets One to Fifty-Two reprinted in book form, 25¢ in coin or stamps**

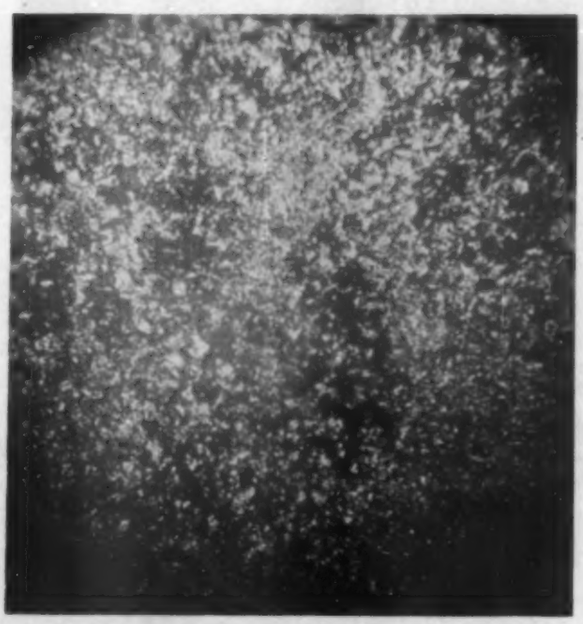
# METAL POWDERS AND ORGANIC PLASTIC BINDERS

by J. DELMONTE*

PROBABLY THE BEST KNOWN AND THE OLDEST applications of organic binders and metal powders are in the powdered iron cores for special electrical apparatus. Heaviside (1) was among the first to prepare cores of this nature, though other investigations on powdered iron cores are described at earlier dates (2). Finely divided iron wires with wax binders were described by Heaviside as being effective in reducing eddy current loss. Eddy currents arise as a result of magnetic flux traversing the metal in an alternating current field. All modern electrical rotating machinery, transformers, etc., utilize a laminated structure to reduce iron losses, the eddy current loss being expressed as a function of the square of the thickness of the iron lamination and the flux density. Sometimes the stacked laminations are bonded by synthetic resin varnishes to reduce magnetic hum by filling the interstices between laminations. However, even more effective in reducing eddy currents, and considerably more costly, are the powdered iron cores, which in their small size limit the path of the circulating induced eddy currents. The small particles must be insulated from one another, and in fulfilling this requirement the organic resin binders are particularly useful.

Above—Typical wireless coil with powdered iron core and synthetic resin binder is almost full size

Finely divided copper in phenolic resin binder, magnification—100 diameter—is shown below



The characteristics of the early compressed powdered iron cores were described in a paper by Speed and Elmen (3). Asphalt dissolved in carbon tetrachloride and shellac were among the binders used. At this time, the most important uses of the powdered iron cores were in the construction of loading coils for telephone circuits. The loading coils are introduced at regular intervals in the telephone circuits to increase the inductance of the line. In molding the cores, pressures up to 250,000 pounds per square inch were used. This was followed by baking at 125° C. An appreciable difference exists between insulated and uninsulated powdered iron cores, the former having lower though more uniform permeability within a given magnetizing range. Magnetic permeability is expressed as a ratio of the flux density to the magnetizing force (B/H). The maximum permeability of some molded iron cores are in the neighborhood of 150. For comparison, some solid steels are measured in the thousands, while the permeability of air is one. The decreased permeability of insulated, molded iron cores may be attributed to the dielectric gaps between individual particles, as created by the organic plastic binder content. As will be seen below, a good insulation between metal particles is to be desired for high frequency electrical apparatus.

Before analyzing further the utility of organic binders to the construction of molded powdered iron cores, a review of the patents will reveal miscellaneous developments that have taken place within the last several years. On the basis of the text of the patents issued, one would gain the impression that recent developments of binders for powdered metals in the United States have

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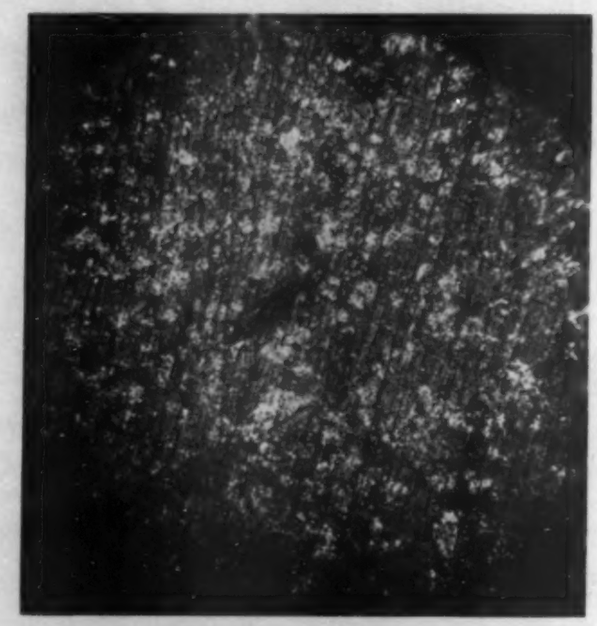
been prone to favor the use of inorganic or ceramic binders. On the other hand, more interest in synthetic resin binders has been evidenced for metal powders in recent foreign patents. No doubt, the recent developments of synthetic resins with superior dielectric qualities will materially promote the use of the organic binders. Nevertheless, as recently as two years ago a high frequency magnetic material with a magnesium-ferrous powdered alloy developed in this country, rejected synthetic resins in favor of a crolite ceramic, because of losses "10 to 100 times of good ceramic materials" (4).

There are, however, circumstances under which inorganic binders are essential and these generally involve baking operations at elevated temperatures. For example, some of the newly developed magnetic iron-nickel alloys require high temperature heat treatments to develop their good magnetic qualities. At these temperatures the organic resin binders would decompose, leaving voids in the structure. In fact, this technique is sometimes employed for producing porosity in metals. Further, the sintering of metal powders is often used to bring out certain metallic qualities. The sintering temperatures, though below the melting point of the metal powders, are considerably higher than the decomposition points of the organic resins. These temperatures are effective in uniting the mass and increasing the strength of powdered metal compacts (5).

Polystyrene and acrylic resins are mentioned in connection with the preparation of an insulating material of high dielectric constant and low dielectric loss, in one French patent (6). Finely divided aluminum and iron powder mixed homogeneously with synthetic resins, including amber and polystyrene is described in another patent (7). Polystyrene alone or with cellulose derivatives have been used in the preparation of magnetic cores by Siemens-Halske A. G. (8). As further examples, one will find that polyvinyl and acrylic resins are employed in uniting powdered iron cores (9). In this last connection, phosphoric acid and phthalic acid are mentioned as softening agents. In these patents various methods of combining the resin and metal powder together are suggested. Sometimes the powdered iron is insulated by the simple expedient of artificially creating an oxide coating on the surface. In other instances a primary resin is employed for insulation purposes, while a second resin is utilized for binding. In processing the compounds, certain economies may be realized by grinding the insulating material or organic resin in the presence of the metal powder, by combining the grinding and mixing operations in the ball mill (10).

Cellulose derivatives have also been used in preparing magnetic cores. One patent describes a magnetic core construction in which films of cellulose acetate, charged with finely divided iron particles, are applied to the core (11). The metal particles may be given an additional insulation before application to the film. Cellulose derivatives have also been specified in cores for radio accessories, such as in band pass filters, oscillating coils, coupling coils, etc., except that the cellulose plastics were applied to the molded surfaces to improve mechanical strength and lower (*Please turn to page 74*)



Phenolic resin binder and powdered lead in molded bearing material is shown in top photo. Lower illustration is powdered iron core with synthetic resin binder. Magnification of both is 100 diameter

## References


1. O. Heaviside, The Electrician, Feb. 11, 1887, p. 302.
2. J. Jamin, "Magnets of Compressed Powder," Comptes Rendus, 81, 1875.
3. B. Speed and O. Elmen, "Magnetic Properties of Compressed Powdered Iron," Trans. A.I.E.E., vol. 40, 1321, 1921.
4. H. Crowley, "High Freq. Magnetic Material," Radio Engr., 16, p. 15, Oct. 1936.
5. L. Schlecht, "Uber die Verfestigung von Pulverformigen Carbonyleisen Durch Warme und Druckbehandlung," Z. F. Electrochemie, 37, p. 485, 1931.
6. Dynamit A. G., "Insulating Material," French Patent 793,574, Jan. 27, 1936.
7. British-Thomson-Houston Co., "Magnetic Cores," British Patent 458,002, Dec. 10, 1936.
8. Siemens-Halske A. G., "Magnetic Cores," British Patent 427,325, April 15, 1935.
9. I. G. Farbenindustrie A. G., "Magnetic Cores," French Patent 787,557, Sept. 23, 1935.
10. I. G. Farbenindustrie A. G., "Magnetic Cores," French Patent 810,625, March 24, 1937.
11. Ward & Goldstone Ltd., "Inductances," British Patent 416,583, Sept. 13 1934.

# NEWER USES OF GLYCERIN IN SYNTHETIC PLASTICS AND RESINS

by GEORGIA LEFFINGWELL and MILTON A. LESSER

AN EXAMINATION OF THE LATEST PATENT AND research literature indicates that the range of applicability of glycerin in the plastics and resin field is steadily broadening. As the unusual combination of physical and chemical properties of this fluid are studied, new uses are being found for it in almost every phase of this essentially modern field of production. Especially significant is the growing role played by glycerin in the manufacture of molded and extruded products. Also notable is the use of glycerin in the treatment of other synthetic plastics and resins to improve their properties or increase their range of usefulness.

The glyceryl-phthalate or alkyd resins continue, of course, as the most important basic group of products made with this fluid. These products are finding increasing use and importance in the manufacture of protective coatings (1) and as impregnating, insulating and laminating agents. Interest is manifest not only here, but abroad as well, where the alkyds are receiving intensive study (2, 3, 4). Recent examples from the patent literature are illustrative of new uses for the glyceryl-phthalate resins. A procedure for making oil-soluble resins for use in coatings and such, goes forward in a single step by the simultaneous reaction of glycerin, a plurality of polybasic acids and certain fatty acids. These fatty acids are responsible for the oil-solubility of the resins produced (5). Barsky (6) describes a process by which a castor oil-glyceryl-phthalate resin can be blended with drying oil by heat, without the use of an intermediate high-boiling solvent. In another patent, a reaction complex, which contains rubber among other ingredients, is used with glycerin and phthalic anhydride to produce a resinous coating compound (7). Numerous other instances of glycerin's value in the production of resins for protective coatings can be readily cited (8).

Glycerin has always been a major ingredient of the glue-glycerin type of printers' rolls and the like. These are being replaced to some extent by the use of the alkyd resins. In a new process, a printing roll is made by surfacing a steel core with a flexible, resilient, non-oil-absorbent, printing-ink-resistant glycerin-containing resin (9). Other oil-resistant materials for making printers' blankets, rolls and matrices utilize plastic polymers of chloroprene and an alkyd resin (10).

Among the newer utilizations of glycerin in making molded products is the use of azoamine condensation products treated with glycerin. In an example, melamine is condensed with aqueous formaldehyde, and the dehydrated mass is mixed with glycerin and wood flour, hot kneaded, comminuted, and then molded (11). Bradley (12) describes processes by which maleic acid or anhydride may be esterified with glycerin to yield materials useful in the manufacture of plastics or coating compounds, or as rubber substitutes for use in making gaskets, floor coverings or insulation. The glycerin esters may be modified with various substances or there may be added to them, reactive phenol-, or urea-formaldehyde condensates or vinyl, acrylic or methacrylic polymers.

In the manufacture of elastic objects from polyvinyl alcohol, glycerin is employed as a softening agent. The mixture used, consisting of the alcohol, 15–50% of glycerin, and water, is worked into a kneadable mass, pressed into the desired form and then heated to 135–180° C. to obtain the desired elastic objects (13).

A newer, and very significant use for glycerin combinations has been presented by Hodgins and Hovey (14) in connection with urea-formaldehyde film-forming compositions. These workers point out that, "Urea-formaldehyde resins have been on the market for a number of years. While they have been noted for their light color and color retention, they have also had the defects of poor water and moisture resistance, poor adhesion, poor stability, and lack of compatibility and uniformity." The use of a glyceryl-phthalate interaction product, combined with the urea-formaldehyde resin, has overcome these difficulties. These workers give extensive and detailed data on these newer combinations, and their findings are well worth consideration.

Sansone (15) gives an excellent description of the method of forming glycerin-phenol plastics in the presence of sulfuric acid. These resins, known as "Acrolites," can be varied in hardness, color, fusibility and dielectric properties by various control and treatment methods.

This brief review does not purport to cover even a fair proportion of the newer applications of glycerin in plastics and resin manufacture. Rather, illustrative examples have been given to show the potentialities and advantages obtainable by the employment of this fluid, especially significant to the producers of plastics and resins, because of recent world events.

**REFERENCES**


1. Esselen, G. J., & Bacon, F. S., Ind. & Eng. Chem., 30:125, 1938.
2. Petrov, G. I., Andrianov, K. A., & Dzhenchel'skaya, S. I., Org. Chem. Ind. (U. S. S. R.) 5:21, 1938.
3. Dreher, E., Kunststoffe, 28:35–7, 114–17, 1938.
4. Hirano, S., & Ohashi, K., J. Soc. Chem. Ind. Japan, 41: (supplemental binding) 90, 1938.
5. Rosenblum, I., U. S. Pat. 2,116,125, May 3, 1938.
6. Barsky, G., U. S. Pat. 2,121,334, June 21, 1938.
7. Kellog, J. H., Jr., U. S. Pat. 2,123,605, July 12, 1938.
8. Leffingwell, G., & Lesser, M. A., Am. Paint J., 22:48 (May 23) 1938.
9. Safford, M. M., U. S. Pat. 2,125,817, Aug. 2, 1938.
10. British Thomson-Houston Co., Ltd., Brit. Pat. 479,625, Feb. 9, 1938.
11. Soc. pour l'ind. chim. a Bale, Brit. Pat. 486,577, May 30, 1938.
12. Bradley, T. F., Brit. Pat. 483,908, April 28, 1938.
13. Vohrer, H., U. S. Pat. 2,127,896, Aug. 23, 1938.
14. Hodgins, T. S., & Hovey, A. G., Ind. & Eng. Chem., 30:1021, 1938.
15. Sansone, R., British Plastics, 10:252, 1938.

# Plastics Digest

**This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them**

## General

THE IMPACT OF PLASTICS ON INDUSTRY. H. Levinstein. Chem. and Ind. (London) *38*, 176–7 (Feb. 25, 1939); 189–93 (Mar. 4, 1939). A plea for national planning with respect to raw materials, particularly timber, coal and petroleum, and their conversion into essential chemicals, for many of which England is now dependent upon foreign sources of supply.

WORK AND FUNCTIONS OF THE STATE TESTING BUREAU AS TO PLASTICS. R. Nitsche. Kunst.-Technik u. Kunst.-Anwendung *9*, 39–47 (Feb. 1939). The functions of the government testing laboratory are outlined and its contributions to the development and standardization of test methods for plastics are reviewed. Equipment of the laboratory is illustrated.

THE SCIENCE OF RHEOLOGY AND THE PLASTICS INDUSTRY. G. W. Scott Blair. Brit. Plastics *10*, 566–8 (Mar. 1939). The materials used in the plastics industry are subject to a control which must be essentially rheological. In practice many decisions are based on subjective judgments of experts. There is therefore need for a psycho-physical study of the processes involved in order to eliminate personal inefficiencies.

PROGRESS IN MANUFACTURE AND USES OF PLASTICS. Kunststoffe *29*, 57–88 (Mar. 1939). The Leipzig Spring Fair issue features a group of articles of wide interest. Titles and authors are as follows: Planning a Molding Plant, H. Turnwald and H. Horstmann, pp. 57–9; Plastic Button Manufacture, F. W. Künzel, pp. 59–64; Zippers by Injection Molding, M. E. Laeis, pp. 65–7; Design of Molded Parts, pp. 67–8; Design and Use of Plastic Bearings, pp. 68–9; New Automatic Injection Presses, E. Hempel, pp. 70–1; Extrusion Production of Hardenable Plastics, W. Tochtermann, pp. 71–6; Injection Press for Thermosetting Resins, K. Knür, pp. 76–7; Laminated Plastics in Apparatus Construction, E. Wirth, pp. 78–81; Use of Vinyl Polymers as Wall Covering, R. Röhm, pp. 82–4; Plastics in Radio Construction, E. Römer, pp. 85–6; and Plastic Tops for Laboratory Tables, E. Wirth, pp. 87–8.

## Materials and Manufacture

A NEW PLASTIC. Kunst.-Technik u. Kunst.-Anwendung *9*, 95–6 (Mar. 1939). The properties of "Ultrapas," a melamine resin, are listed and compared with those of "Pollopas," a urea resin.

A NEW POLYMERIC HYDROCARBON PLASTIC. A. Schwarz. Kunststoffe *29*, 9–14 (Jan. 1939). A survey of the properties, grades, and uses of Oppanol B (known as Vistanex in the U. S.) prepared from isobutylene.

ELASTIC AND PLASTIC PROPERTIES OF RENNET CASEIN. C. A. Cooper and P. G. T. Hand. Brit. Plastics *10*, 572–7 (Mar. 1939). The compressibility and recovery of 60 samples of casein from various countries was determined with a Plastometer. The effect of varying temperature, pressure, and moisture content on the deformation of these caseins was also studied. No definite relation was established between the plasticity of the various samples and their fat content, ash, pH, etc.

METHACRYLATE RESINS. D. E. Strain, R. G. Kennelly, and H. R. Dittmar. Ind. and Eng. Chem. *31*, 382–7 (Apr. 1939). Data are given for the physical properties, solubilities, and compatibilities with resins and plasticizers of polymeric methyl, ethyl, propyl, butyl, and isobutyl esters of methacrylic acid.

STUDIES ON CELLULOSE COMPOUNDS. E. Berl and W. Koerber. J. Am. Chem. Soc. *61*, 154–7 (Jan. 1939). Solubilities of samples of cellulose nitrate and cellulose acetate at room temperature and −50° C. are listed and discussed.

STRUCTURE OF PLASTIC MOLECULES. H. Staudinger. Kunststoffe *29*, 1–3 (Jan. 1939). A discussion of the dependence of the physical properties of plastics on their molecular structure and of the problem of systematic synthesis to obtain desired qualities.

## Applications

SYNTHETIC - RUBBER - IMPREGNATED FABRIC MAKES VIBRATION - PROOF TANK. Aero Digest *34*, 78 (Feb. 1939). The new tank not only eliminates the need of a gas-tight metal fuel container, but also offers vibration-proof characteristics far in excess of present tolerances. The plastic-fabric bag is laid in place in an interior cell of wing or fuselage somewhat as inner tubes are installed in tire casings.

INSULATING MATERIALS IN 1938. A. R. Dunton. Electrician *122*, 97–8 (Jan. 27, 1939). Developments in production of high-frequency, low-loss insulation are reviewed. The following data are quoted from a table listing various materials in the descending order of their power factor performance at a frequency of 10,000: Pure quartz 0.00009, Mica 0.00019, Styrene resin 0.0004, Porcelain 0.006, amber 0.018, Phenol-formaldehyde resin 0.025

NEW SYNTHETIC RESIN INSULATION FOR WIRE. E. J. Flynn. Elec. World *111*, 296 (Jan. 28, 1939). "Formex" wire, insulated with a polyvinyl acetal resin, is definitely superior to ordinary enameled (drying-oil type) magnet wire with respect to abrasion resistance, cracking caused by heating after elongation or bending, heat aging, flexibility, and resistance to softening by commonly encountered solvents.

INDUSTRIAL ADHESIVES. J. L. Perkins. Product Eng. *10*, 135–6 (Apr. 1939). Pioneered in the furniture, shoe and rubber goods industries, cemented assemblies are now widely used in such diverse products as airplanes, electrical equipment, automobiles, ships, printing presses, and novelties. Various types of adhesives and their applications are listed.

TRUE TO SCALE. Plastics *3*, 76–7 (Mar. 1939). The use of plastics in making models of airplanes is discussed.

NEW SYNTHETIC TEXTILES IN RELATION TO WOOL. H. A. THOMAS. Chemical Age *40*, 62 (Jan. 28, 1939). The following classification of new fibers is presented. 1. All protein fibers (Lanital, Lactofil, Casein Fibre, Tiolan, and soybean silk); 2. Regenerated cellulose containing protein (Cisalpha, Fibramine, Lacisana); 3. Animalized or basified viscose rayon (Rayolanda, Artilana, Vistralan); 4. Synthetic resin fibers (Nylon, Vinyon); and 5. Physically modified viscose staple fiber (Fibro, Vistra TX, Lanusa).

## Coatings

COATING MATERIAL FOR PAPER. H. R. Thies. Paper Trade J. *108*, 96, 98–102 (Feb. 23, 1939). The structure and x-ray diffraction patterns of various rubber derivatives are given. The adaptation of Pliolite, a cyclized rubber derivative, to paper coating is discussed. When highly moistureproof, strongly heat sealing, transparent and glossy coatings are desired, a coating from solution is indicated. Where transparency is not a factor and some gloss or heat seal strength can be sacrificed, the Pliowax type of coating can be employed, applied either as a hot melt or from solution.

NEW CHEMICALS USED IN LEATHER. P. I. Smith. Chem. and Met. Eng. *46*, 72–3 (Feb. 1939). Ethyl cellulose is used for straight lacquer finishes and incorporated with natural and synthetic waxes in the manufacture of wax finishes and water-bound pigment dopes. Progress has been made with acrylic resins for finishing morocco and good grade fancy leathers and upholstery. Chlorinated rubber in combination with chlorinated naphthalene and other synthetic and natural waxes is receiving serious consideration. In Germany resins of the polyvinyl chloride type are being used as finishes for upholstery leather.

## Testing

PHYSICAL TESTING OF AIRCRAFT PULLEYS. H. R. Moyer. Aero Digest *34*, 63–4 (Feb. 1939). Laminated plastic pulleys used in aircraft control systems save weight and wear on the cables. Standard specification tests for crushing strength, bearing bond, and endurance strength are described.

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# U. S. Plastics Patents

**Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each**

ADHESIVES. A. H. Bowen and T. W. Dike (to I. F. Laucks, Inc.). U. S. 2,150,147 and 2,150,148, March 14. Making clear liquid urea-formaldehyde resins in presence of a small proportion of zinc chloride; and spray drying such a resin under conditions yielding a powder which will form a glue solution in hot or cold water.

TRANSPARENT NETTING. J. S. Tinsley (to Hercules Powder Co.). U. S. 2,150,301, March 14. Netting is coated with a film of plasticized cellulose acetopropionate, acetobutyrate or acetovalerate and a castor oil modified alkyd resin.

VARNISH RESIN. John H. Kelly, Jr. U. S. 2,150,506, March 14. Condensing fused rubber-rosin resins with glycerol to form a varnish resin.

TAR RESIN. C. A. Thomas and F. L. Taylor (to Monsanto Chemical Co.). U. S. 2,150,641, March 14. Polymerizing the unsaturates in cracking still tars in presence of aluminum chloride, and separating the resulting resin from the residual naphthalene hydrocarbons.

PLYWOOD ADHESIVES. Jas. V. Nevin. U. S. 2,150,697 and 2,150,-698, March 14. Coating wood plies with an aqueous solution of a partial cresylic acid-aldehyde condensation product to make plywood; and making such aqueous resin solutions by alkaline condensation of cresylic acid with formaldehyde.

GRINDING WHEEL. Edw. Van der Pyl (to Norton Co.). U. S. 2,150,886, March 14. A disk of resin-bonded metal powder is faced around its periphery with a layer of resin-bonded diamonds.

CELLULOSE ESTER PLASTIC. S. E. Palmer (to Eastman Kodak Co.). U. S. 2,150,939, March 21. Plasticizing cellulose acetate with a liquid which is also a solvent, but cooling the plasticizer below the temperature at which it is effective as a solvent.

POLYSULPHIDE PLASTICS. G. Källner and G. Krause (to Silesia Verein Chemischer Fabriken, Ida- und Marienhütte). U. S. 2,151,212, March 21. Effecting alkylene dihalide-polysulphide condensations in aqueous solution in presence of water-soluble cellulose ethers.

CELLULOSE PLASTICS. B. Anderson and A. F. Caprio (to Celluloid Corp.). U. S. 2,151,311, March 21. Plasticizing cellulose derivatives with polyglycol esters and ether-esters.

HAMMERED METAL FINISH. G. Ariotti (to Atlas Powder Co.). U. S. 2,151,312, March 21. A spray lacquer giving a hammered metal effect contains a metal powder and a natural or synthetic resin.

BOTTLE CAP. T. M. Hill (to Aluminum Co. of America). U. S. 2,151,383, March 21. A foil facing on the cork cushion of a bottle cap is cemented in place with a thermoplastic adhesive, and coated with a protective vinyl resin lacquer.

ACETYLATED WOOD. E. C. Sherrard, E. Beglinger, J. P. Hohf, R. L. Mitchell and E. Bateman (to Henry A. Wallace, Secretary of agriculture of the U. S. A.). U. S. 2,151,412, March 21. Making a molding composition by acetylating sawdust with glacial acetic acid and acetic anhydride.

PLASTICIZER. J. S. Kimble and S. E. Palmer (to Eastman Kodak Co). U. S. 2,151,476, March 21. Blending cellulose acetate with dimethyl phthalate at 0-15° C., then extruding at not over about 200° C.

VINYL RESINS. H. Fikentscher and G. Hagen (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,151,507, March 21. Use of aromatic carboxylate esters of monoaryl glycol ethers as softeners in vinyl chloride resins.

PEN BARREL. Robert Back (to Wahl Co.). U. S. 2,151,548, March 21. Winding a strip of pyroxylin helically into a tube in making pen or pencil barrels.

MAGNIFYING LENS. Nathan M. Stanley. U. S. 2,151,573, March 21. Making a reading lens of synthetic resin, in an elongated shape with curved top and straight side walls.

PHENOLIC RESINS. Jas. E. Symonds. U. S. 2,151,945 and 2,151,-946, March 28. Making transparent phenolic resin castings from vacuum-evaporated anhydrous initial condensation products.

VARNISH. Harry Kline (to Bakelite Corp.). U. S. 2,151,975, March 28. A resin made from formaldehyde and a substituted phenol is used in varnishes.

HYDROGENATED RESIN. Wm. H. Carmody (to Neville Co.). U. S. 2,152,533, March 28. Catalytically hydrogenating a hard synthetic resin in solution.

LACQUER. H. S. Cooper (to Cooper Products, Inc.). U. S. 2,152,536, March 28. A blended cellulose derivative-synthetic resin-drying oil coating is pigmented with boron nitride.

VARNISH. Wm. R. Catlow, Jr., and H. F. Wakefield (to Bakelite Corp.). U. S. 2,152,633, April 4. Compounding a drying oil with an oil-soluble phenol-aldehyde resin and a drier.

RUBBERY PLASTIC. R. M. Thomas (to Standard Oil Development Co.). U. S. 2,152,828, April 4. Eliminating tackiness, decreasing cold flow and increasing tensile strength and elasticity in polyisobutylenes by treatment with sulphur chloride.

FLUORESCENT INK. Jos. L. Switzer. U. S. 2,152,856, April 4. A fluorescent lithographic ink is made with a drying oil, a colorless resin, aluminum hydroxide, a fluorescent dye and a solvent.

GAME BALLS. Elvin M. Bright (to J. M. Wallace). U. S. 2,152,-867, April 4. Making game balls with a shell nitrocellulose composition and a core of sulphurized silica, mixed with asphalt and molded under pressure.

TRANSPARENT WRAPPING. Ernest Saraga. U. S. 2,152,925, April 4. Flexible, highly resistant transparent sheets are made of gelatin, softened with aqueous glycerin and impregnated with a cellulose ester and a tanning agent.

LIGNIN PLASTICS. E. C. Sherrard, E. Beglinger, John P. Hohf and E. Bateman (to Henry A. Wallace, Secretary of Agriculture of the U. S. A.). U. S. 2,153,316, April 4. Making a moldable fibrous plastic composition from fibrous vegetable material by acid hydrolysis under steam pressure.

CONDENSATION PRODUCTS. K. Stickdorn (to Deutsche Hydrierwerke Aktiengesellschaft). U. S. 2,153,318, April 4. Hydrogenating natural resins or resin acids to the corresponding alcohols and condensing these with inorganic acids, in presence of a catalyst, to make resinous products.

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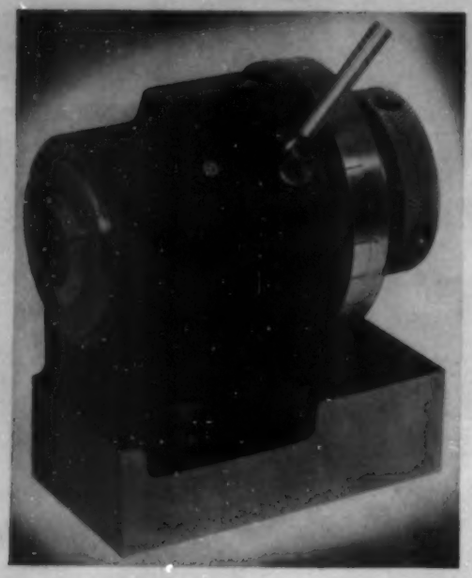
# Equipment



HARDINGE COLLET INDEX FIXTURE (ILLUSTRATED ABOVE) may be used for rapid, accurate indexing, for miller, grinder and shaper applications and as a drill press, as well as for holding work. It can be purchased separately or with Tailstock and Sub-Base for holding work between centers.

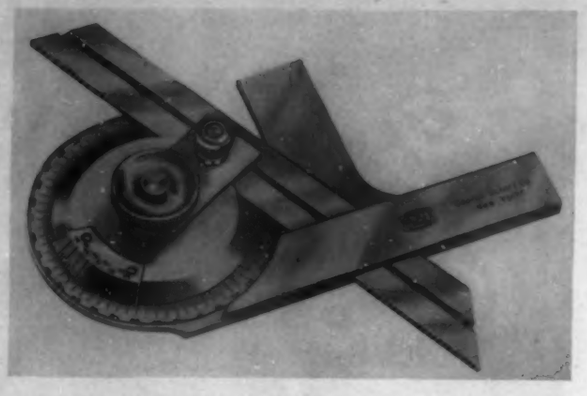
INCREASING USE OF THE PHILLIPS RECESSED HEAD SCREW throughout many branches of industry has resulted in licensing agreements between American Screw Co. of Providence, R. I. and Chandler Products Co. of Euclid, Ohio, Scovill Manufacturing Co. of Waterbury, Conn., Pheoll Manufacturing Co. of Chicago and Lamson & Sessions Co. of Cleveland. Continental Screw Co., New Bedford, Mass., Corbin Screw Corp., New Britain, Conn., National Screw & Mfg. Co., Cleveland, Parker-Kalon Corp., N. Y., and Russell, Burdsall & Ward Bolt & Nut Co. of Port Chester, N. Y., have long been licensees.

The Phillips Recessed Head Screw employs a principle that makes possible much faster assembly work than with slotted screws. Many nationally known manufacturers of motor cars, air-craft, door hinges, window moldings, electrical appliances, and various wood and metal products are now using these screws.

On products such as washing machines, Phillips Screws present the special advantage of freedom from burrs which tear clothing. This is due to the fact that the close fit between the Phillips driver and the recessed screw head presents no opportunity for reaming out the metal, which causes burrs to be thrown up on the edge of a slot. Wood screws, machine screws, sheet metal screws and stove bolts are now being manufactured with the Phillips feature.

ACCORDING TO ITS SPONSOR, CONTINENTAL MACHINE Specialties, Inc., the Model V-36 Doall introduced a short time ago replaces operations formerly performed by the "torch," shaper, milling machine, nibbler and lathe. This new machine tool has a 36 in. throat, 10 in. work height capacity and a 30 in. square table which tilts four ways. It cuts shapes and contours in the toughest steels as well as in aluminum, brass, plastics and softer substances.

HIGH SPEED PHOTO ELECTRIC COUNTING EQUIPMENT CAPABLE of 600 counts per minute or 36,000 counts per hour, is announced by Lipman Engineering Co., Pittsburgh, Pa. The device is supplied complete with photo electric amplifier and contact relay unit, light source with adjustable bracket, power supply control box and counter in four or six digit models. Polarized plugs are used for connections and permit service or replacement of a unit in several seconds. Estimated tube life, 7,000 to 10,000 hours. Booklet on request.



THE GEORGE SCHERR CO. ANNOUNCES A NEW UNIVERSAL bevel protractor (illustrated above) of Mauser manufacture. This precision tool may be used for all types of work where angles must be laid out or measured. The dial is graduated in degrees for the full circle in 4 x 90 = 360 deg. A vernier is provided which gives readings within 5 minutes of the arc ($^1/_{12}$ of a degree). The tool may be obtained with either 6, 8 or 12 in. blades, which are bevelled at each end to 45 deg. and 60 deg., respectively. The back of the tool is finished flat so that it may be flush when laid on work. The dial may be clamped rigidly by a thumb nut, while the blade may be clamped independently.

A NEW SERIES OF TIMERS COMBINING FLEXIBILITY, ACcuracy and ruggedness with low price has been announced in a bulletin of the Automatic Temperature Control Co., Inc., of Philadelphia.

AN IMPROVED CEILING SWITCH, MADE OF TEXTOLITE AND with modern styling has been announced by the wiring device section of the General Electric appliance and merchandise department. The new switch, Cat. No. GE857, replaces a previous switch of the same number which had a porcelain base and metal cover. The older switch is no longer available.

RATIO COUNTING SCALES, ENGINEERED AND BUILT BY THE Exact Weight Scale Co., combine proven visible counting principle with streamlined appearance. Adaptable for both predetermined counting and for checking unknown quantities, these scales speed counting in packaging, inventory work or in filling shop requisitions.

MORRISON MASTER FEED FINGERS WITH ADJUSTABLE TENsion, introduced at the American Society of Tool Engineers' Show in Detroit, in March, are constructed to meet the varying tension requirements of automatic screw machines. Adjusted, the desired tension is maintained when the tube is applied to machine.


THE MICRO SWITCH CORP. HAS DESIGNED A ROLLER LEAF actuated Micro Switch (illustrated above) for service in applications where small moving power is available to make or break circuits; where low friction, minimum change of operating point through wear are required; and where roller action is needed between the cam and the switch lever. The overall size is $2^1/_2$ in. long, $1^3/_8$ in. high, and $^3/_4$ in. wide. Handles $^1/_2$ h.p. Either the Standard or Type Z Micro Switch can be obtained with the roller leaf actuator. The $^3/_{16}$ in. wide roller, with a diameter of $^3/_8$ in., is case hardened and mounted on an oilless bronze bearing. The true roundness of the roller is held within .002 inch.

# Publications

**Write for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publishers' advertised prices.**

## British Plastics Year Book, 1939

### Published by The Plastics Press Ltd., London

**Price $3.60 net (in England)** **584 pages**

This grand annual is the Hand Book and Guide to the plastics industry in Great Britain and could well be used as a reference or text book in any library or college. It starts off with a brief description of the commonly used plastics and their origin, written by our own George K. Scribner of the Boonton Molding Company of Boonton, N. J.

Phenol formaldehyde resins and patents are discussed by A. J. Buck, A.R.C.S. Urea resins and patents are described by James Taylor, B.Sc. Cellulose acetate is covered by V. E. Yarsley, D.Sc. M.Sc. F.I.C. Ethenoid resins are handled by Dr. C. A. Redfarn.

The balance of the book is devoted to names and addresses of those in the industry in Great Britain and the Colonies: Proprietary names; Materials; Plants; Manufactured products; Associations and societies; and a voluminous chapter called "Who's Who in the Industry."

E. F. L.

## Molding and Casting

### by Carl Dame Clark

**Distributed by Warren-Knight Co., 136 No. 12th St., Phila., Pa. Printed in the U. S. A.**

**Price $4.50** **308 pages**

This is an important book for moulage workers, sculptors, artists, physicians, dentists, criminologists, craftsmen, pattern makers and architectural modelers because it clearly presents the results of many years of research and experience by the author in his work as Associate Professor of Art as Applied to Medicine at the University of Maryland School of Medicine.

Formulas and technique for meticulous reproduction through the media of plaster, agar, moulage, resin-wax, celluloid, cellulose acetate are completely described. Rubber molding and casting is detailed with the most recent discoveries in the treatment of both molds and castings clearly set forth. The simple instructions in the text will enable anyone to reproduce delicate finger prints, facial masks, anatomical masks, statues or almost anything one can imagine. There is even a chapter titled: Molding and Casting Eyes.

The subject matter, although based entirely upon scientific research and practice, is written in such a manner that any one can follow its simple directions. Sixty-nine half-tone illustrations showing more than one hundred examples of the work serve to clarify the text. It is the most complete and the most fascinating book on scientific mechanical reproduction that we have seen, and fills a definite need. The materials and methods outlined however, should not be confused with the synthetic resins which depend upon heat and pressure in a metal mold for their ultimate cure and production. E. F. L.

MONSANTO PLASTICS, SERVANTS OF MODERN INDUSTRY, IS the title of a new catalog just published by Monsanto Chemical Co., Plastics Division, Springfield, Mass. Illustrated by four-color process plates with spiral plastic binding and transparent Vue-Pak cover, the catalog outlines the various plastics made by the company and pictures their more recent applications. Processes and technical data enliven the book and make it valuable to all those who are using plastics or planning to do so in merchandise or product development.

REED-PRENTICE CORP., WORCESTER, MASS., have issued a new bulletin covering their 10A 2 and 4 oz. and 10D 6 and 8 oz. Plastic Injection Molding Machines, which will operate manually, single cycle or automatically. Complete specifications are included as well as illustrated construction features and standard equipment.

## Physical Constants of Hydrocarbons. Vol. 1. Paraffins, Olefins, Acetylenes, and other Aliphatic Hydrocarbons

### by Gustav Egloff

**American Chem. Soc. Monograph No. 78**
**Reinhold Publishing Corp., 330 W. 42nd St., New York, 1939**
**Price $9.00** **403 pages**

This work presents the melting points, boiling points, specific gravities, and indices of refraction of the aliphatic hydrocarbons. Two additional volumes are to list the corresponding data for the nonbenzenoid cyclic hydrocarbons and the aromatic hydrocarbons, respectively. A fourth volume will cover the correlation of physical properties with structure, thus allowing detection of errors in existing data, prediction of constants of unknown hydrocarbons, and derivation of relationships giving a deeper insight into the structure of these molecules. This collation and critical evaluation of the physical constants of hydrocarbons is intended to be of service to workers in pure and applied science and in industries such as the petroleum, natural and manufactured gas, chemical, rubber, plastics, and pharmaceutical. It will unquestionably be recognized internationally as the outstanding source of such data in the hydrocarbon field. G. M. K.

## The Properties of Glass

### by George W. Morey

**American Chem. Soc. Monograph No. 77**
**Reinhold Publishing Corp., 330 W. 42nd St., New York, 1938**
**Price $12.50** **561 pages**

Glass has been termed an "inorganic resin" and resins have been referred to as "organic glasses." This situation emphasizes the similarity which exists in the physical make-up of the inorganic and organic plastics. Investigators in the latter field will find the information contained in this book on glass very helpful in planning studies of the physical properties of the organic plastics and in providing a convenient source of comparative data for glass itself. The various chapters on the chemical, strength, hardness, thermal, optical, electrical and magnetic properties of glass are preceded by a choice discussion of the glass of antiquity and the beginnings of modern glass manufacture.

A few lines quoted from the author's preface will best reveal the scope and treatment of the subject matter. "The information in the literature concerning the properties of glass is of widely differing accuracy and reliability, and I have indicated my judgment wherever such indication seemed desirable.—Emphasis has been placed on the physical properties as functions of composition." He writes further of the "awakened realization by the glass industry that the soundest foundation for a strong industry is the understanding of its fundamental scientific principles." The diligent and systematic effort which go to make a work of this type invaluable is forcibly brought home by the author's notation that "work was begun on this monograph in 1924." It might well serve as a pattern for a similar review of the properties of organic plastics. G. M. K.

"CIGARETTEPROOF" FORMICA TABLE TOPS, ILLUSTRATED in a bulletin from The Formica Insulation Co., Cincinnati, Ohio, offer protection also from alcohol and other liquids. Both plain colors and various designs with color inlays are available in satin and linen finish. All factory built table tops are smoothed against high spots and have a sealing ply on the bottom to keep out moisture and prevent warping.

GENERAL LIGHTING INFORMATION SERVICE HAS RECENTLY published its second volume at 25, Victoria Street, Westminster, London, S.W.1. This is a non-advertising bulletin of Technical and Market information on the subject of lighting, compiled by H. L. Juliusburger, lighting engineer. The bulletin gives a comprehensive view of the development of lighting and subsidiary lines abstracted from publications and data gathered throughout the world. Subscriptions in U. S. A., 10 issues, $10.00.

# NEWS

MOLDERS WITH STOCK ITEMS OR INACTIVE MOLDS FROM which stock items may be turned out are invited to send samples to MODERN PLASTICS magazine for its stock mold pages. Brief description of each part submitted should accompany all samples. There is no cost or obligation for this service and many a manufacturer has bought his first plastic application because something pictured in these stock mold pages was just what he could use in production.

GROUND HAS BEEN BROKEN FOR A NEW FIVE-ACRE BUILDing for home office and factory of Toledo Scale Co., Toledo. Albert Kahn, Inc., Detroit, are the architects, and A. Bentley & Sons of Toledo, the general contractors. The new structure will combine the six different plants which the company now operates in that city.

THE TEXTILE COLOR CARD ASSN., 200 MADISON AVE., N. Y., it was announced by Margaret Hayden Rorke, managing director has been appointed by the British Colour Council as the sole authorized distributor in the United States and Canada of the *Royal Colour Book* containing the colors selected and approved by Her Majesty Queen Elizabeth of England for the British Colour Council as the colors to commemorate her visit to the United States and Canada.

LORD & TAYLOR WILL GIVE FOUR $1000 AWARDS FOR INDUSTrial design again this year, according to a recent announcement by Walter Hoving, president. "I am convinced that American designers are capable of competing with any of the famous foreign designers,and we are anxious to foster more skilled designing of American-made goods," Mr. Hoving said.

"The establishment of these awards was an effort to stimulate and encourage better designing; focus attention on the best designing work and thus help educate the public to greater discrimination; stimulate the creation of new products with which to expand American business; establish higher standards of beauty for the commercial world to keep pace with the improving taste of the American people."

Through the designer's interest in new materials which give greater scope to his work, and through available new methods of handling plastics and the creation of more flexible compounds, these materials should gain greater recognition and use through design competitions.

THE METAL SPECIALTY CO., CINCINNATI, WITH MAIN OFfices and plant in that city, manufacturing division in Kokomo, Ind., and sales office in Detroit, has taken over the physical assets of the molding division of Belmont Plastics, Inc., also of Cincinnati. Equipped for injection molding, they expect to specialize in the production of plastic veneer over metal or reinforced (by metal) plastic molding. Development work in the automotive manufacturing field will be continued.

ANNOUNCEMENT HAS JUST BEEN MADE THAT THE SEVENteenth Exposition of Chemical Industries will be held this year at Grand Central Palace, New York City, during the week of December 4 to 9. The Exposition this year is completing its 25th year of service to the chemical and allied industries. Since its inception in 1915, the Chemical Exposition has become the traditional means by which the industry's manufacturers and engineers convene to take inventory of material and equipment advances. This event has come to be recognized as a great contribution to continued progress of the chemical industries. The Seventeenth Exposition will be managed by the International Exposition Company under the personal direction of Charles F. Roth, President. Mr. Roth has been in charge during all the sixteen earlier appearances of the Chemical Exposition.

NORMAN BEL GEDDES, PROMINENT AMERICAN DESIGNER, who has spent the last year conceiving and directing the execution of the General Motors exhibit at the New York World's Fair, has leased extensive space in the new Associated Press Building in Radio City.

## OCTOBER DIRECTORY LISTINGS FOR 1939

We are mailing a registration blank within a few days to every firm listed in our 1938 Directory with the request that they fill in the blank with their proper listings and return at once.

If any of our readers have entered the plastics field in any way during the last year and wish to be listed, in our new 1939 Directory we urge them to request a listing blank which will be sent promptly.

There is no cost or obligation involved through this listing and we hope you will cooperate to make this new October Directory as complete as possible.

Listings include: Molders, Laminators, Fabricators, Injection Molders, Raw Materials, Supplies, Chemicals Machinery, Molds, Equipment, Design and Consultant and Testing services.

"KNITTED WIRE," PATENTED FLEXIBLE SEAMLESS TUBING made by E. H. Titchener & Co., Binghamton, N. Y., has many applications in industrial, decorative and display fields. It can be plated, rust-proofed, enameled or coated, or covered with rubber, silk or fabric. Rows of resilient loops, made of one strand of wire, interlocked, form a continuous tube, which is obtainable in many diameters and lengths.

REMOVAL TO LARGER HEADQUARTERS AT SUNNYSIDE AVE., Stamford, Conn., combining two factories under one roof, was announced by the Thomas Mason Co., injection molders, finishers, and assemblers. Sales office will remain at 11 West 42nd St., N. Y.

WORD HAS JUST REACHED US OF A NEW DEVELOPMENT IN automatic molding, a 50-ton completely automatic press developed by Standard Machinery Co., Mystic, Conn. It is reported that the press embodies some very novel, original features of design and that one has been installed by a large New England custom molder. Like other Standard molding equipment this new press will be sold through the F. J. Stokes Machine Co., Philadelphia.

J. EARL SIMONDS, PLASTICS CONSULTANT, ANNOUNCES HIS new location at 5 DeForest Avenue, Summit, N. J., with laboratory facilities and complete service for plastics plants, materials and markets.

THE PLASTIOGRAPH CO., NEW YORK CITY, has moved to larger quarters at 120 West 20th St. The company, of which C. A. Tenney is the head, is the originator of the "Plastiograph" process for printing on molded plastics, glass and metal.

ACQUISITION OF RESINOX CORP., THIRD LARGEST MANUfacturer of phenolic plastics molding compounds, was announced May 4th by Monsanto Chemical Co. Resinox, with general offices in the Whitehall Building, N. Y., and manufacturing plant and research laboratories at Edgewater, N. J., was owned jointly by Commercial Solvents Corp. and Corn Products Refining Co. The financial details of the transaction were not divulged. All Resinox personnel is being retained. Monsanto's acquisition of Resinox is its second major move in the plastics industry in thirteen months. On April 1, 1938, the Fiberloid Corp., Springfield, Mass., pioneer maker of plastics, became the Plastics Division of Monsanto.

ELIMINATING THE NEED FOR SPACE-CONSUMING PROTECtive coatings in many instances, Formex wire, a new magnet wire announced by General Electric at the 1939 Winter Convention of the A.I.E.E., New York City, is insulated with a synthetic resin which is said to be tougher and more flexible than the conventional enamel coat-

ings. The new resin is of the polyvinyl acetal type, while enamel coatings are composed of drying-oil resins. Since Formex wire requires less space for insulation and protection, it gives the designer new opportunities to reduce the size of many products. Further, electrical properties are as good as those of ordinary enameled wires, and tests show that Formex wire is considerably higher in resistance to abrasion and to the common treating solvents.

VISITING THIS COUNTRY FOR FOUR MONTHS TO STUDY American product development, design, and merchandising, Walter Landauer of Industrial Design Partnership, London, England, is shown here discussing a design for a molded cosmetic container with W. B. Petzold, G. E.'s plastics designer and stylist. As part of his study of American plastics, Mr. Landauer has been spending some time in the General Electric plant at Pittsfield, Mass.

In addition to his association with Industrial Design Partnership, Mr. Landauer is a Fellow of the Royal Society of Arts, Chairman of the Plastics Section of the Society of Industrial Artists and one of its council.

THE PLASTICS DIVISION OF ERIE RESISTOR CORP. announces that Edward Seaver has become associated with the company. Mr. Seaver is a mechanical engineer of wide experience having been in charge of motor design of Curtis Airplane Co. and for eleven years with Talon Inc. of Meadville, Pa. He has also served in consulting capacity in the development of many different products.

SORRY!

IT MAY HAVE BEEN A TOUCH OF SPRING FEVER, OR worrying as to whether or not the New York World's Fair would open on time, that caused us to stumble so badly when we approved the proofs of our *Plastics in Review* for the April issue. Whatever the cause, we are truly sorry and wish to rectify the errors and omissions which have been called to our attention.

Item 4, Page 38, should have read: Pompous penguin cigaret lighter molded by Kilgore Mfg. Co. promotes Brown and Williamson's "Kools." Black and white body and yellow beak and feet are of Lumarith while gray hat is of heat-resistant Bakelite. Louisville Electric Mfg. Co. handled the assembling and furnished the bird's electrical "innards."

Item 3, Page 38, should have read: It's the last straw—pops right up out of the bottle. Called ZYX, these sterile straws are made by the Stone Straw Co. from transparent Lumarith Protectoid for the Safety Thirst Company.

A BRITISH PLASTIC DEVELOPMENT WHICH SHOULD HAVE wide possibilities is the "roll top" shutter manufactured by Crystalate, Limited, of London, and fitted to one of the Pye Radio cabinets. Roller shutters in wood are well known, but the plastic counterpart is a novelty of which much more will be heard. The moldings are carried out in units of two strips, the sections being backed with strong canvas. As the strips are actually molded into the canvas, the strength and durability of the plastic materials should far exceed that of the wood products. There are numerous possible uses in domestic and industrial life for a plastic roller shutter of this nature, which is resistant to the corrosive action of fumes and moisture alike.

GILBERT ROHDE, INDUSTRIAL DESIGNER, ANNOUNCES THE removal of his offices to 22 East 60th St., N. Y.

A NEW INK FOR WRITING ON GLASS OR ENAMELED WARE, available in black and white, is announced by the Stewart Research Laboratory. Unlike some previous etching inks this new product is non-corrosive, yet is said to provide a method of permanent marking. Known as S. R. L. Brand L N Glass Ink, it is reported able to withstand long immersion in hot water and to resist the action of hot strong acids and concentrated alkalies. It is not affected by ordinary laboratory solvents.

MODERN PLASTIC CO. REPORTS THE NEW LOCATION OF ITS office and factory at 4641 Pacific Blvd., Los Angeles, Calif. The telephone number is KImball 6196.

ROBERT HELLER, NEW YORK INDUSTRIAL DESIGNER moved to his new offices in the Associated Press Bldg., 50 Rockefeller Plaza on May 1st. Air conditioned and sound-proofed throughout, several of the rooms will be completely windowless to allow for controlled lighting and color experimentations.

AUBURN BUTTON WORKS, INC., AUBURN, N. Y., CUSTOM molders, announce the election of George P. Anderson as vice-president of the corporation.

ENTERING ITS EIGHTH YEAR OF PLANNING MANUFACTURing processes for the nation's industries, at its recent annual convention in Detroit, the American Society of Tool Engineers elected James Riley Weaver president succeeding Walter F. Wagner. Mr. Weaver lives at North Irwin, Pa., and is director of equipment, inspection, purchases and tests, of the Westinghouse Electric & Manufacturing Company's East Pittsburgh works.

EARL MANDLE, INDUSTRIAL DESIGNER, ADVISES US THAT his studio is now located at 515 Thirtieth Street, North Bergen, N. J.

A NEW SPIRIT SOLUBLE COLOR, "LUXOL" FAST BLUE MBS, for making transparent lacquers and spirit printing ink colors, is announced by E. I. du Pont de Nemours & Co. In alcohol solutions it may be used for coloring leather, paper, celluloid and wood. The dyestuff produces bright greenish shades of blue. It is equal in strength to "Luxol" Fast Blue AR and "Luxol" Fast Blue G, but much greener and brighter and possesses better fastness to light than either of these dyestuffs, the company reports.

NON-INFLAMMABLE, CELLULOSE ACETATE SPIRAL BINDING for books, magazines, pamphlets, etc., has been developed by Monsanto's Plastics Division at Springfield, and applied under patents held by the Spiral Binding Co. Unlimited color range in opaque, translucent or clear effects and any desired width, diameter or pitch of binding are features of this strong, flexible material.

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MODERN PLASTICS PREFERRED, A 16 MM. SOUND AND COLOR film showing many phases of the plastics industry, is available without cost to clubs, schools, Chambers of Commerce, company sales conferences, conventions or any business gathering interested in plastics. For bookings during Summer and Fall, write Modern Plastics Magazine, Publicity Director, 122 East 42nd St., New York.

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Here are some of the plastic objects contributed to Oglethorpe University, which will be placed in the Crypt of Civilization. The young lady holding the electric iron will leave before the crypt is sealed—we hope

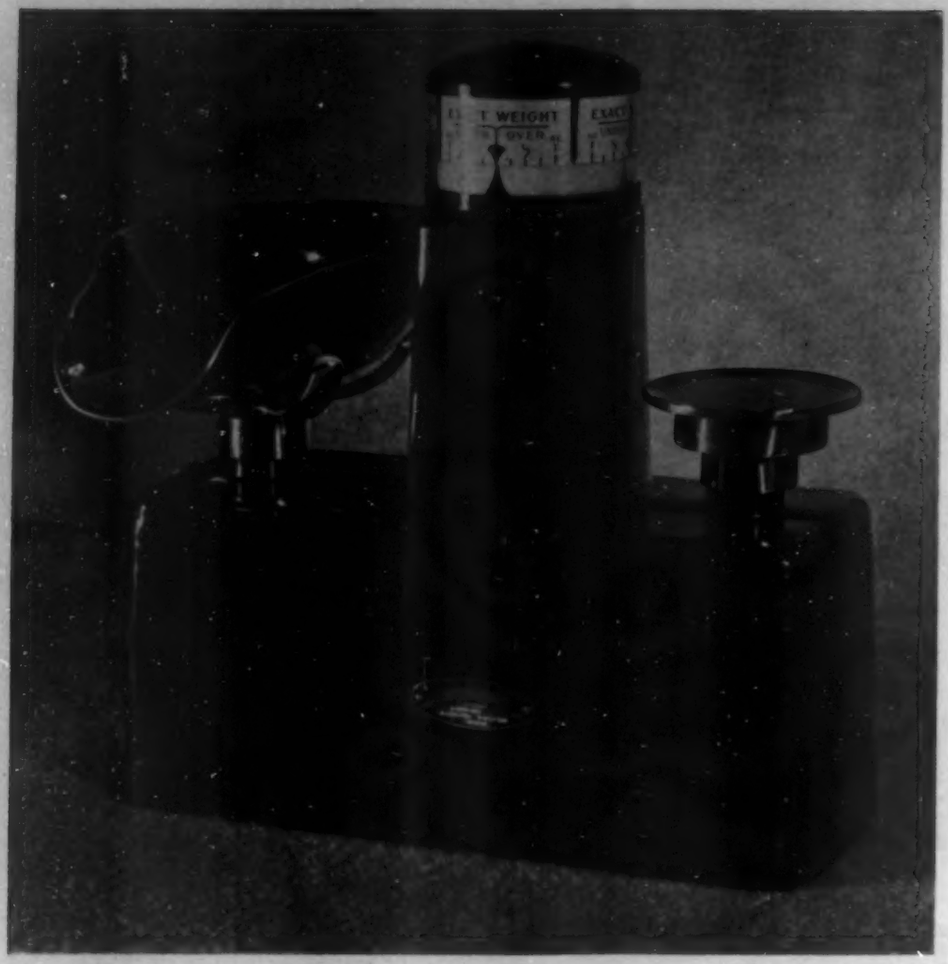
# 6000 YEARS HENCE

**If you want your ancestors in the year 8113 A.D. to stand with awe and admiration as they behold your handiwork of today—then rush some of your best molded and cast plastic products to Dr. T. K. Peters, Archivist, at Oglethorpe University, Georgia, to be cached in the Crypt of Civilization**

THE DEVELOPMENT OF PLASTICS DURING THE last twenty-five years has been so phenomenal that it seems hardly possible to predict what improvements will be made during the next twenty-five years. Therefore it will require a prodigious stretch of the imagination to contemplate what will happen to the industry in *six thousand years*. Will practically every thing that we now make of metal be changed into plastics? Will whole houses be molded from plastics with inserts of methyl methacrylate for windows, or will the entire house be transparent to admit the ultra-violet portion of the spectrum with some sort of plastic blinds inside that will polarize the light and cause a pleasant shadow inside when desired? Will fluorescent materials be incorporated into the plastic walls to be actuated by some at present unknown force causing the entire wall to give out a pleasing glow at night? Idle conjecture today endlessly pursued, tomorrow culminates in fact.

It would be possible to conjure up a million possibilities, but there is one reality that will be certain, and that is that some of our present day plastic objects, which may be so marvelous to the people of the year 8113 A.D. that they will look like miracles, or which may seem so crude and archaic as to arouse only the most indulgent curiosity, will be on exhibition on that day in May six thousand years from now, when the Crypt of Civilization at Oglethorpe University is opened.

What plastics are seen when the crypt is opened will depend upon the interest shown today by those in the industry and upon their generosity and imagination. T. K. Peters, Archivist of Oglethorpe University has written to many firms soliciting objects having a synthetic resin base and has asked for contributions of specific and characteristic items for inclusion in the Crypt of Civilization which is purely a scientific venture. The response has been gratifying (*Please turn to page 72*)




Transparent "lighthouse" window reveals exact weight fore and aft. Designed by Sundberg and Ferar, the Exact Weight scale is molded in five parts by Kurz-Kasch, Inc., of Bakelite, Beetle and Crystalite

# CREATING A BETTER BALANCE

by CARL W. SUNDBERG & MONTGOMERY FERAR

THE BALANCE SCALE, WITH SCOOP AT ONE END and weight platform at the other, is a more or less familiar object—it has been around a long time. A pound of gumdrops in the scoop, a pound weight on the platform and the arm teeters up and down until it achieves an approximate balance. Actually the contents of the scoop may be a bit over or slightly under a pound. Usually there is no real check on the exact weight.

Recognizing a definite need for precise weighing facilities particularly in drug and candy store trades, where the quantities handled are small, the Exact Weight Scale Co. has recently developed a new scale of the balance type. Simple in construction, good to look at, this latest addition to the scale family promises more efficiency in operation and greater accuracy than older types.

The scale chassis consists of a base, supporting a balancing arm which has a conventional scoop attached at one end and a weight platform at the other. The arm actuates a vertical shaft at the top of which is a calibrated drum giving plus or minus weight readings, which are repeated all the way around. When the scale is in operation, this drum is automatically illuminated giving a "lighthouse" effect to the tower. As the gumdrops or whatever are poured into the scoop, arrows traveling horizontally indicate over or under weight. Both the clerk, working behind the counter and the customer, standing in front of the counter, can see when the exact weight is reached.

For years the company has specialized in the manufacture of custom-built, precision scales, invariably choosing aluminum sand castings for chassis housings. This material involved many costly hand processes which, although satisfactory when production was low, would prove expensive and impractical in the larger quantities anticipated for the new scale. Because they eliminated hand-filing and finishing processes necessitated by the former method; because of their lightness, flexibility of form and beauty (*Please turn to page 72*)

## POLYSTYRENE AT WORK

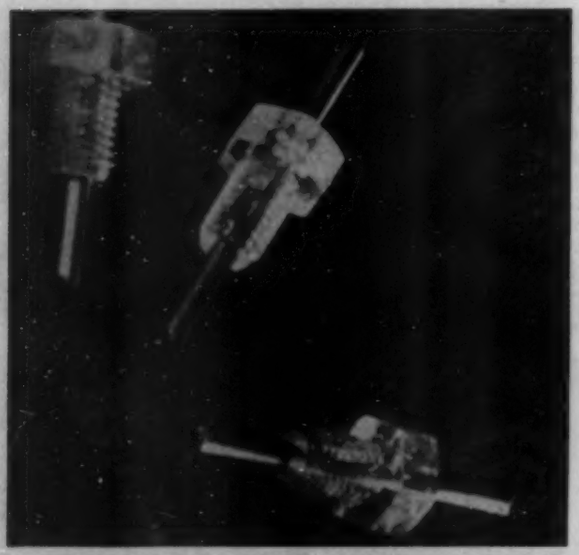
(*Continued from page 36*) high temperatures, tests indicate that molded parts of ordinary type will withstand temperatures up to 150 deg. F. without distortion when the load involved is simply its own weight. Molded parts have extreme dimensional stability at normal temperatures and because of the low molding shrinkage (.002 inch per inch) can be formed accurately.

It has been found that its electrical properties are without equal in the plastics field. In the matter of power factor and dielectric constant it is superior to any molded plastic. Therefore, it provides an insulation which makes possible more efficient current transmission. This marks the difference between success and failure in circuits used in ultra-short-wave radio frequencies and television. In a field of thirty million cycles such as occur in these circuits, it is the only plastic that works satisfactorily. In fact, it is one of the few plastics which does not actually disintegrate by the stresses set up under such frequencies. The loss factor of the material under discussion is less than .00053. Its power factor is less than .0002. Both are extremely low.

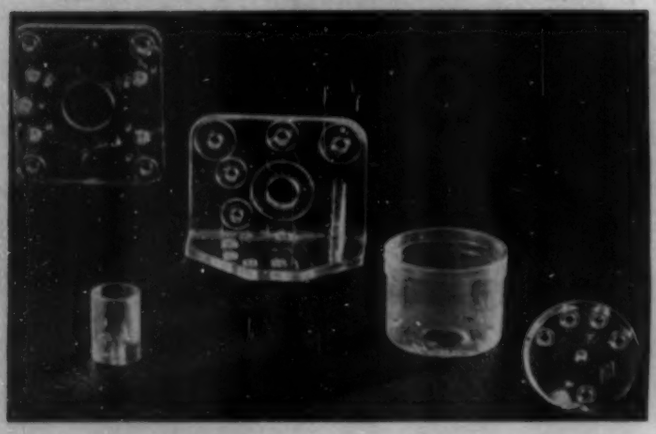
The material is unaffected by ordinary concentrations of both acids and alkalies which indicates its applications in the chemical field where many types of insulation and instrument housings are subjected to acid fumes and alkalies which would destroy the protective value of other materials with less resistance.

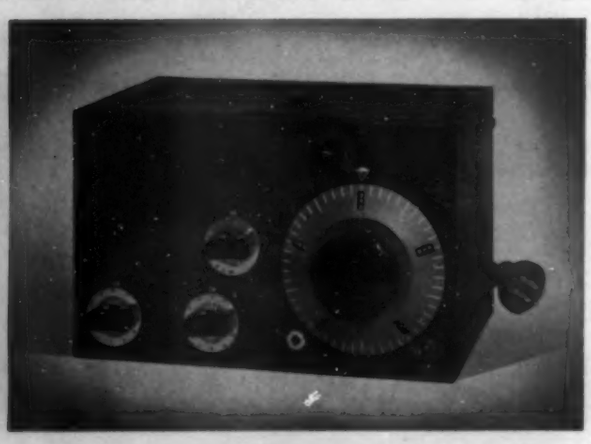
Polystyrene is also more resistant to shock than inorganic insulators which possess comparable electrical properties. This makes it capable of being used alone in thin sections, whereas many inorganic insulators must be used in heavy sections to protect them from damage by shock. If weight is a factor, polystyrene has an advantage here as well. The low specific gravity, or weight per unit volume, of the material makes it possible to get more molded pieces of the same size from a pound of molding material. To illustrate: Specific gravity of phenolics and acetates ranges around 1.35, while that of polystyrene is 1.07. Therefore, it will be seen that approximately 25 percent more pieces may be produced from a pound of polystyrene than from a pound of phenolic or acetate molding compounds.

The question of shrinkage after molding is important in molding instruments and housings for parts where close tolerances are required. Tests indicate that polystyrene will hold dimensions better than other thermoplastics due to the fact that there is no shrinkage from evaporation of plasticizer. There is also little tendency to cold flow, and very slight water absorption. Therefore, pieces molded from polystyrene are inclined to hold extremely close dimensions upon aging—a property worthy of commendation in any plastic.



Lead-through bushings at the left magnified to slightly more than twice their actual size show the transparency of material forming molded hexagonal heads and threads, and directly below are coil insulator, angle bracket, mountings, and tube base, all molded of Bakelite Polystyrene by Thomas Mason Co. At the right—complete radio communicating device in which they are assembled by the National Company





## SAFETY SANDWICH

(*Continued from page 46*) its "yielding break," and the toughness of the polyvinyl plastic.

Dr. Weidlein said the high-test laminated safety glass "will prevent uncountable tragedies in highway accidents." The new plastic, he said, "has the remarkable property of stretching under relatively low stresses until its elastic limit is reached, at which point considerable additional stress is necessary to make it fail. Such physical properties render the material ideally suited to resist impact when used as a safety glass interlayer."

He paid tribute to glass research workers for the development of methods for economical production of the thin polished plate glass used in the new "safety sandwich," providing clear, undistorted vision. "Laminated plate glass," Dr. Weidlein said, "can be rendered safer by decreasing the thickness of the glass and so decreasing the amount of energy necessary to break it before the flexibility of the plastic comes into play. The production of thin plate glass, somewhat less than one-eighth inch thick, is an accomplished fact and is a triumph of engineering skill."

Tests have shown that at ordinary temperatures the new safety plate glass is about twice as "strong" (i. e., resistant to impact penetration) as the regular cellulose acetate plastic type; at zero, it is five or six times as strong. A passenger trapped in a car equipped with polyvinyl plastic safety glass may force the glass out of its frame more easily and with less danger of injury, tests have shown.

These characteristics were dramatically demonstrated by Dr. Smith, using a half-pound steel ball dropped on samples of different types of glass from varying heights and at different temperatures. A sample of cellulose acetate safety plate, cooled down to 20 deg. in an ice-box on the stage, was completely shattered and pierced when the ball was dropped only 12 ft., while a similarly chilled sample of high-test glass cracked and stretched but easily turned aside the steel ball dropped from the ceiling of the lecture hall, a distance of 28 feet.

The "yielding break" of the new glass was shown when an iron-headed synthetic John Doe was hurled with terrific force against the high-test windshield of an old demonstration "jalopy" simulating the motion of a passenger in an automobile crash. The glass star-cracked and bent, the dummy bounced, but there was no penetration, and the glass and plastic clung together so there was no shower of glass.

Performance of some of the breaking tests on solid plate glass—just by way of contrast—brought many a shudder to those attending the demonstration as they saw jagged chunks of glass fly from the windshield and recalled the "prelamination" days of auto glass.

To show the unusual toughness and flexibility of the

Left—Not a pair of silk hose but the new resilient plastic "insides" for safety glass is stretched almost double its length. Top—Large pane, broken by hammer blows is rolled up like a rug; shattered glass adheres to polyvinyl acetal resin interlayer

new glass-and-plastic sandwich, Dr. Smith took a long sheet of high-test which had been broken by hammer blows, "waved" it before the audience like a housewife shaking a rug, and then rolled it up.

"Polyvinyl plastic is resistant to moisture, which makes unnecessary the sealing of the edges, and will not separate from the glass," Dr. Smith said. "Replacement is a simple matter," he explained, "since the safety glass may be cut by scoring and cracking, then drawing the glass away from the plastic and slitting the latter with a razor blade."

Recognition of the part the sponsors of the research played in "winning the war against highway accidents" and minimizing serious results when accidents do occur was stressed at the dinner in Franklin Hall at which 325 scientists, industrialists and government officials interested in highway safety were present.

The officials who "took the bows" were Dr. George O. Curme, Jr., vice-president of Carbide and Carbon Chemicals Corp.; Arnold E. Pitcher, general manager of the plastics division of E. I. du Pont de Nemours & Co.; John D. Biggers, president of Libbey-Owens-Ford Glass Co.; John C. Brooks, vice-president of Monsanto Chemical Co., and H. D. Wherret, president of Pittsburgh Plate Glass Company.

## COFFEE PLASTICS

(*Continued from page 39*) and physical properties of the different types of coffee plastics are still under way, but for the types at present produced, certain characteristics are well established. For instance, the thermosetting material has good dielectric strength (at low electrical frequencies), compressive strength of 8,000 to 12,000 pounds per square inch, good resistance to weak acids, fruit acids, etc., resistance to alkalis, hydrocarbons, ketones and oils, good resistance to flame conductivity, and its water resistance may be judged by the fact that its absorption by weight in 24 hours' immersion at 23 deg. C. is .2 percent (much less than wood).

Naturally, the most important characteristic to South American countries is its low cost of production. One can judge of its value from the standpoint of economy by the fact that one bag of coffee, which under the present surplus regulations would be destroyed at a certain amount of expense to the government, can produce conservatively 40 square feet of plastic $^1/_2$ inch thick, and as a by-product approximately 1.25 gallons of coffee oil. Instead of destroying surplus coffee and reducing the normal production of the country, it may be that within a few years the coffee-producing countries will be "stepping up" production to meet the demands created by the low-priced products stemming from this recent development. A realization of the variety of valuable materials obtainable from the raw green coffee bean may lead to some degree of regret for the thousands of tons of this material which have been burned or dumped into the ocean to stabilize the coffee beverage market.

## CREATING A BETTER BALANCE

(*Continued from page 66*) of finish, allowing far greater leeway in expressing the function of the product, plastics were selected for the job.

Consistent with its use on candy counters and in drug stores where space is always at a premium, the scale has been kept as compact as possible. The base enclosing the mechanism ($5^7/_8$ in. high, 6 in. wide and $13^7/_8$ in. long) is molded of phenolic or urea material. Three steps are incorporated into the design at the top of the base to offset a proportion made obligatory by the mechanism. The tower, also of phenolic or urea ($13^7/_8$ in. high) tapers slightly in a graceful sweep toward the top. Large fillets at the bottom of the tower blend imperceptibly into the rectangular base. The illuminated drum is of a pastel shade of translucent urea protected by a clear, acrylic resin window, and capped by a removable plastic plate. Altogether the scale weighs $14^3/_4$ lbs. with plastics accounting for but $2^3/_4$ lbs. of this.

Great accuracy was necessary in the design, in the building of tools and in the molding of this scale. The curves, radii and fillets were not simply design affectations put on to make the scale streamlined in appearance. On the contrary, they were absolutely essential from the standpoint of good molding technique, enabling the material to flow evenly into the farthest corners of the exceptionally deep casting which has an eleven inch draw. A raised bead longitudinally down the center of the casting allowed the mold to be made in two shallow pieces.

The Exact Weight Scale Co.'s use of plastic material for its new scale does facilitate production and even more than that, is successful from a psychological aspect. With this material, the designer not only achieves a pleasing functional form, but introduces as well a variety of colors and a permanent depth of finish which reveals an honest, efficient and well built product, inspiring confidence and trust on the part of the purchaser.

## 6000 YEARS HENCE

(*Continued from page 64*) to a degree but many more contributions are essential if the plastic industry is to be as well represented as it deserves.

Plastics themselves are realized imagination, something that never existed in the world before the imagination of man conceived it, hence the desirability of eagerly promoting one of the most imaginative projects the world has even seen.

What is this Crypt of Civilization into which the plastic exhibition is going? Let us travel southward and find out what it is all about.

One day in 1936, Dr. Thownell Jacobs, president of Oglethorpe University, near Atlanta, Georgia, startled the world with the announcement that he proposed to do for the people of the world as far removed in the future as the most ancient recorded date in the past, a complete picture of this world we live in at this time,

pictures that would show our lives, our knowledge, our inventions, our beliefs in regard to God and immortality and all of our quaint manners and customs as well as our social attainments. This material would be reduced to the smallest possible space consistent with the importance of the project and would then be stored in a vault deep beneath the earth, under one of the buildings of Oglethorpe University, Georgia.

Objects used in our daily life, artificial aids to replace missing or defective parts of the body such as an artificial eye, an artificial arm, an artificial bakelite skull and other aids are being collected for inclusion. Motion pictures of our history, our industries and our life as well as still photographs of American history since 1840 will be placed in the Crypt. But the most important exhibit, from the viewpoint of the plastics industry, is that devoted to these modern resins. A very considerable display is already on hand but additions to this representing specific uses of plastics are desired. Samples of all materials are on hand and for this reason no more of these are wanted, but objects made from the various plastics are desired. Costume jewelry, boxes, candid cameras, lenses, counter displays, games, mirror and toilet sets, jars, closures, handles, lighting fixtures, platters, cigaret cases, clocks are examples of the things desired, things used in our everyday life. Motion pictures of the manufacture of plastics are also required for deposit. These should be sent to T. K. Peters, Archivist, Oglethorpe University, Georgia. A suitable acknowledgement in the form of a certificate on parchment will be sent to the donor and will serve to remind the people generations from now when the crypt is opened that their ancestor one hundred and eighty-seven generations in the past were altruistic minded enough to provide a picture for their descendents of the world they lived in, away back in ancient history in the year 1939 A.D.

## METHYL METHACRYLATE RESINS

(*Continued from page 35*) wind-shields and windows of aircraft. For this purpose low density, lack of brittleness, clarity and stability to light exposure are contributing factors. Thin gages with air space between make the windows mist-proof; a valuable feature in many flying conditions.

Not only for utility, but to attract the potential buyer, automotive appointments made of this plastic have taken an important place in this year's models. On one make of car the speedometer, radio, and clock panels are molded of this plastic to give an edge-lighted effect to set off the numerals. The plastic is also used for a crystal-clear insignia covering at the hub of the steering wheel. Two de luxe car models carry the transparent plastic as a decorative piece for the radiator ornaments. Another application on one of the leading 1939 makes is in two molded directional lenses on either side of the tail light which are illuminated by a switch on the hand gear shift to indicate to the automobile following, the direction in which the driver intends to turn. This is another major step toward overcoming many accidents.

Besides the uses already mentioned, other products which give some idea of the number of uses now established, are listed in the following:

Products from sheets, rods and tubes: Decorative panels and insets for automatic phonographs; decorative crystal balls and cylinders for restaurants and clubs; door knobs; automobile and truck sun visors; costume jewelry; elevator signals; hand-bag frames; machinery guards; models to show working parts of product; magnifiers for slide rules; parts of deep sea fishing reels; rings for propellor shafts to keep required areas free from chrome plating in acid bath; transparent pneumatic tube units; and windows in industrial machinery.

Typical injection molded products are: Antiseptic applicators; fountain pen parts; indicator panel light buttons; jewelry display cases; lip-stick containers; miniature locomotive headlights; novelty jewelry; saxophone and clarinet mouthpieces; typewriter key covers, magnifying lenses and vanity cases.

Compression molded products include: Automobile speedometer, radio and clock panels; automobile rear-end directional signal; automobile and truck reflectors; ear pieces for hearing aids; highway reflectors; insignia covering on steering wheel; and transparent sections for varied types of containers.

In preparing the above article, reference has been made to the following articles:
"Acrylic Resins," Industrial and Engineering Chemistry, March 1936, page 267.
"Methacrylate Resins," Ibid, October 1936, page 1160.
"The Rise of the Plastics Industry," Chemistry and Industry, June 1938, page 607

## METAL POWDERS AND ORGANIC PLASTIC BINDERS

(*Continued from page 50*) radio frequency losses (12).

Up to this point, relatively little has been said concerning the use of thermosetting plastics in molded iron cores. They have been applied since the early days of phenol plastics, and their use has extended to a multitude of powdered metal objects, including metallized carbon brushes, bearings, metal abrasive materials, paints, etc. The phenol-aldehydic plastics have been particularly useful in molding powdered metal cores for high frequency electrical apparatus. One application (see 12) describes them in this respect. Metal powders are mixed with an alcoholic solution of a phenol-aldehydic condensation product, dried, and molded under 60 tons per square inch. Another process utilizes 400 mesh iron particles insulated by an oxidized varnish. This powder is mixed with phenol resin binder and molded at 100° C. under a pressure of 5–25 tons per square inch (13). The product contains approximately 90% of iron by weight. Comparison with pure iron shows the molded product to have the following properties:

| | Molded Core | Pure Iron |
|---|---|---|
| Density (grs./cc.) | 4.6 | 7.8 |
| Resistivity (ohm-cm.) | 50 | $10^{-5}$ |
| Initial Permeability (Ring Specimen) | 10 | 50 |

Much work has been done upon the molding of various iron alloys and synthetic resin binders, as well as inorganic binders. One noteworthy alloy, "Permalloy" is described in powdered form in one paper (14). These

magnetic alloys are of singular interest because of their unusual magnetic properties. As far as the inorganic binders are concerned, space does not permit their discussion, though it may be pointed out that sodium silicate and various clays (15, 16) have been the subject of much investigation.

As far as the organic plastic binders for powdered metal cores are concerned, there are patents covering the more common types, including the urea plastics, alkyds, and certain natural resins, not hitherto mentioned. Of course, consideration must be given to the deleterious effects of powdered iron upon certain synthetic resins. Some of the polyvinyl resins are so affected, and would not be suitable as a binder for such materials. An oxide layer on the iron may partly alleviate this condition.

There are certain qualities of molded powdered iron cores which are particularly attractive to the electrical and radio engineer. Within the last five years or so, molded cores began making their appearance in wireless apparatus, though applications of this sort were suggested as early as 1902 (17). Summarizing briefly, the molded cores are desirable for high frequency apparatus for the following reasons:

1. Less turns and less copper is required,
2. Higher ratios of inductance to resistance are obtained. (These are expressed as the figure of merit of the coil, $Q$),
3. For a given $Q$, the space requirements are considerably reduced from those formerly required for air cores,
4. Higher gain and selectivity in receiver operation.

For a favorable $Q$ the losses must be low, not only in the eddy currents of the individual iron particles, but also in the insulating binder. At radio frequencies the dielectric losses must be a minimum and for high quality cores, low-loss phenolics or polystyrene must be used. The choice is even more limited in other applications, particularly where temperature is involved. The thermoplastic materials, such as polystyrene or the cellulose derivatives would be eliminated because of their tendency to flow or deform at higher temperatures. Aside from the material limitations, one will find that powdered iron cores for wireless apparatus have been grouped into three classifications (18):

A. Cores for intermediate frequency circuits, enclosing the whole coil—permeability 3-5,
B. Cores for medium wave tuning circuits, bobbin type—permeability 2-4,
C. Straight cylindrical cores—permeability 2.

The last mentioned core is the least expensive and the simplest to manufacture. A well insulated core may have an insulation resistance of 10 megohms per cc.

### Motor Brushes

Though the majority of motor brushes are free of organic plastic binders in their final form, at some time of their manufacture purified coal tar pitch may have been used. High temperature, long period baking operations carbonize the pitch, forming a hard carbon with the lampblack that is used. However, there are patents

# CLASSIFIED



purporting to combine carbon or graphite with metal particles by synthetic resin binders. In one patent a copolymer of vinyl chloride and vinyl acetate is prepared for combination with powdered metal copper and graphite. A fine grade of resin powder is prepared and carefully mixed with the other ingredients in the proportion of 1 : 19 (19). In still another example, a glyceryl phthalate resin is added to a porous carbon brush for increasing the strength and durability (20). This resin is added to a porous brush prepared as such by carbonizing the organic binder used in the first stage of manufacture. Phenol-aldehydic resins are also used as binders in molding some brushes to final form.

The fact that powdered copper is used to increase the electrical conductivity of motor brushes, should be suggestive of applications to molding compositions. Increased electrical conductivity and increased thermal conductivity are two characteristics that will be obtained with increasing proportions of powdered metals to molded plastics. There are applications in which increased thermal conductivity of the molded material is advantageous. Heretofore, the inclusion of metal conducting strips in the molded part has been necessary when it was desirous of conducting heat away rapidly from one point. The inclusion of metal powders in the molded part should help this condition, particularly if a good thermal conductor as copper is used.

### Miscellaneous Metals in Molded Compositions

There are other metals in powdered form which lend themselves to the preparation of molding compositions with some degree of metallic properties. One example is powdered lead which has been used in bearings molded with a phenol-aldehyde resin (for discussion see 21). Lead-copper bearings are well known to mechanical engineers for their minimum lubrication requirements, due to the fact that the lead, present as small particles is self-lubricating. A somewhat parallel condition exists in these molded, resin-bonded bearings.

There are numerous uses for powdered metals in industry and there are a large number of references covering their applications (See 22, 23, for general surveys). As far as the preparation of plastic molding compositions is concerned, there are untold possibilities, particularly where it is desirous of combining the moldability of organic plastics with materials that are distinctly metallic in nature. Metal fillers with organic plastic binders can and will be an important phase of the growing science of powder metallurgy.

### References


12. Standard Telephone & Cables Ltd., "Insulated Cores," British Patent 427,639, April 29, 1935.
13. Johnson Labs-Polydorff, "Magnetic Core Material," U. S. Patent 1,982,689, Dec. 8, 1934.
14. Schackelton & Barber, "Compressed Powdered Permalloy," Trans. A.I.E.E., vol. 47 (2), 429.
15. Western Electric Co., "Magnetic Bodies for Cores," U. S. P. 1,948,308, Feb. 20, 1934.
16. Bell Telephone Labs., "Magnetic Cores," U. S. P. 1,943,115, Jan. 9, 1934.
17. German Patent 143,510, 1902.
18. E. Friedlander, "Iron Powder Cores," Wireless Engineer, vol. 15, p. 473, Sept. 1938.
19. National Carbon Co., "Brushes for Electrical Machines," U. S. P. 1,992,638, Feb. 26, 1935.
20. Stackpole Co., "Carbon Brushes," U. S. P. 2,087,724, July 20, 1937.
21. J. Delmonte, "Plastics in Engineering," Penton Publishing Co. (To be published shortly.)
22. A. Hahn, "Powdered Metals in Industry," Min. & Met., 18, 294, 1937.
23. J. Wulff, "Powder Compacts," Technology Review, Dec. 1938.